

No. 14-1369

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IN THE  
**United States Court of Appeals for the Federal Circuit**

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**HEAR-WEAR TECHNOLOGIES, LLC,**

**Appellant,**

**v.**

**K/S HIMPP,**

**Appellee.**

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**Appeal from the United States Patent and Trademark Office, Patent  
Trial and Appeal Board in Reexamination No. 95/001,021.**

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**BRIEF FOR APPELLANT**

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May 19, 2014

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## CERTIFICATE OF INTEREST

Counsel for appellant, Hear-Wear Technologies, LLC, certifies the following:

1. The full name of every party or amicus represented by me is:

Hear-Wear Technologies, LLC

2. The name of the real party in interest (if the party named in the caption is not the real party in interest) represented by me is:

None

3. All parent corporations and any publicly held companies that own 10 percent or more of the stock of the party or amicus curiae represented by me are:

J&M Sound Technologies, LLC

4. The names of all law firms and the partners or associates that appeared for the party or amicus now represented by me in the trial court or agency or are expected to appear in this court are:

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## STATEMENT OF RELATED CASES

This appeal is from an *inter partes* reexamination of U.S. Patent No. 7,110,562 (“the ’562 Patent”), which is owned by Hear-Wear Technologies, LLC (“Hear-Wear”) (*see* A56; A4547). No other appeal in or from that same action in the U.S. Patent and Trademark Office (“PTO”) was previously before this or any other appellate court. The ’562 Patent is one of four patents asserted in *Hear-Wear Technologies, LLC v. Oticon, Inc.*, No. 4:07-cv-212-CVE-FHM (N.D. Okla.), which is currently stayed pending the outcome of PTO reexaminations, including the one that gave rise to this appeal. A1268-70; A4548. The ’562 Patent was also the subject of an *ex parte* reexamination initiated by HIMPP. A5088; A5607. That reexamination concluded on May 29, 2012, with the PTO confirming patentability of all claims that were reexamined.

## JURISDICTIONAL STATEMENT

The Patent Trial and Appeal Board (“Board”) had subject matter jurisdiction over this dispute under 35 U.S.C. § 134(b). The Board issued its decision on December 6, 2013 (A1-51), and that decision became final and appealable on January 17, 2014 (A52-55). This Court has jurisdiction over the Board’s final decision under 35 U.S.C. § 141(b) and 28 U.S.C. § 1295(a)(4)(A). Hear-Wear timely filed its notice of appeal on January 31, 2014. A6280-81.

## **STATEMENT OF THE ISSUES**

Whether the Board erred in determining that claims 1-9, 11-27, and 30-41 of the '562 Patent are invalid as obvious under 35 U.S.C. § 103.

## **STATEMENT OF THE CASE**

HIMPP filed a request for *inter partes* reexamination of the '562 Patent in February 2008. A1193. The PTO granted reexamination as to claims 1-9, 11-27, and 30-45 (A1226), and the patent examiner initially rejected all reexamined claims as allegedly obvious (A1311; A1313-34). During proceedings before the examiner, Hear-Wear canceled claims 42-45 (A1772); the examiner confirmed patentability of claims 13-14 and 32-37 (A2458); and Hear-Wear appealed the rejections of claims 1-9, 11-12, 15-27, 30-31, and 38-41 to the Board (A4548-51). At the same time, HIMPP appealed the confirmation of patentability of claims 13-14 and 32-37 to the Board. A5639. The Board affirmed the examiner's rejections except as to claims 2 and 23, but the Board entered new rejections of those claims, along with new rejections of previously confirmed claims 13-14 and 32-37. A47-48. Hear-Wear timely appealed the Board's decision to this Court. A6280-81.

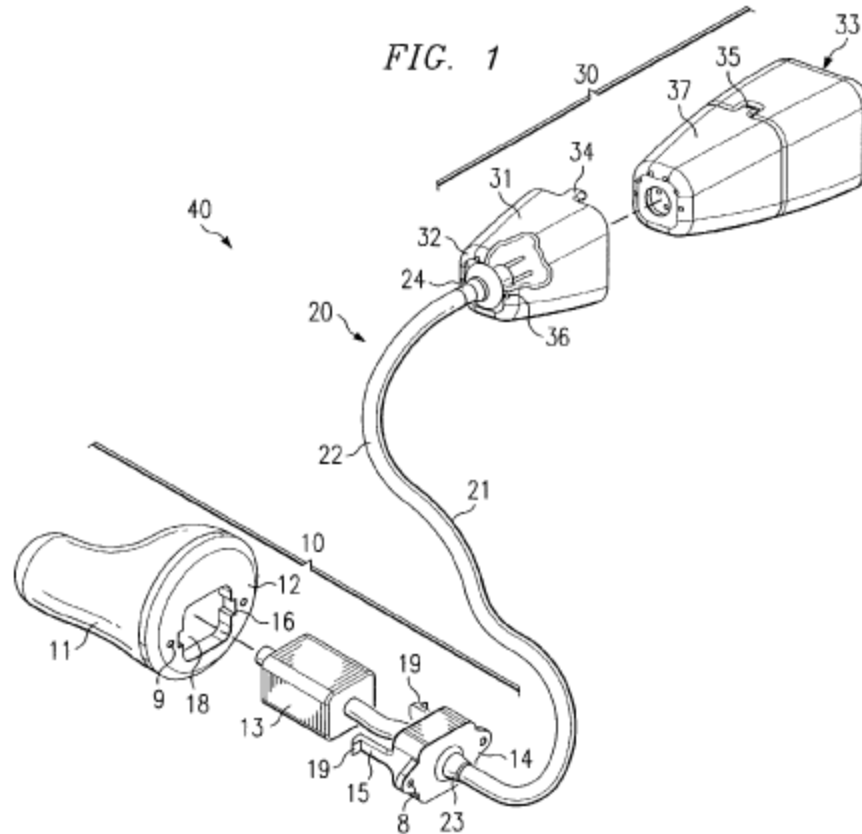
## **STATEMENT OF FACTS**

### **A. The Invention Of The '562 Patent.**

The '562 Patent is directed to hearing aids that seek to accomplish several important objectives valued by users: inconspicuousness, comfort, sound quality,

ease of insertion and withdrawal, and ease of maintenance. The '562 Patent is generally directed to hearing aids that are cosmetically acceptable and comfortable due to their inconspicuous features and small size. *See* A68-69. The hearing aids are also functionally improved due to detachable connections that allow for ease of assembly and disassembly, while still protecting against moisture and other undesirable elements that typically necessitated fixed wiring. *See, e.g.*, A68 (2:47-50); A69 (3:30-49); A70-71 (6:62-7:4); A73 (12:20-34). In addition, they decrease feedback and also minimize the occlusion effect, which is “a plugged sensation” that can result when portions of the hearing aid block the ear canal and impede air conduction. *See* A68 (1:47-53); A69 (3:46-49); A75 (16:10-15).

Figure 1 (reproduced below) illustrates an embodiment of the invention, which includes a behind-the-ear (BTE) component 30, a completely-in-canal (CIC) component 10, and a connector 20:



A58.

As its name implies, the completely-in-canal (CIC) component resides completely inside the user's ear canal—i.e., no part of the CIC component extends outside of the ear canal, such as into the concha that comprises the bowl shaped portion of the ear just outside the ear canal. *See, e.g.*, A167 (2:15-16); A4594 (¶ 11); A4605-08 (¶¶ 9-10, 15-16). As the '562 Patent explains, the CIC component is preferably shaped to fit deep inside a user's ear canal, and in some cases may be configured to touch the bony portion that constitutes the inner part of the ear canal. A68 (1:55-59); A70 (5:44-48). This placement minimizes the occlusion effect and also serves a key goal of hearing aid design by making the

CIC component indiscernible to an observer. A75 (15:47-52, 16:1-5). The BTE component and connector are also preferably indiscernible to an observer, such that the entire device is cosmetically acceptable to a user. A75 (15:47-67). For example, the BTE component would be positioned behind the cartilage of the outer portion of the user's ear, and the connector would be thin, with the portions of the connector that extend outside of the ear canal being taut against the head of the user. *See id.*

Claim 1 and its dependent claims are directed to a hearing aid device having a BTE component, a CIC component, and a connector, all with specific characteristics. *See* A78-79; A5665-66. Claim 1 recites:

An earpiece auditory device comprising:

a behind-the-ear (BTE) component, said BTE component being shaped to fit behind an ear of a user, wherein said BTE component comprises a module including processing circuitry;

a completely-in-canal (CIC) component, said CIC component being shaped to fit into the ear canal of the user, wherein said CIC component comprises an ear mold and a speaker, said speaker being encased in a speaker module;

and a connector physically and communicatively coupling said BTE component to said CIC component, said connector having a proximal end physically and communicatively coupled to said BTE component and a distal end physically and communicatively coupled to said CIC component, said connector being sufficiently rigid so as to allow said connector to be used to insert and remove said CIC component from the ear canal of the user;

wherein said speaker module is detachably physically interconnected with said ear mold, said speaker module is interconnected with said ear mold through a hollow sleeve, and said hollow sleeve is formed of resilient material.

A78.

Thus, the CIC component includes a speaker (e.g., speaker 13 in Figure 1, *supra* at 4) encased in a speaker module. *Id.*; A70 (6:28-29) Further, the connector that attaches the BTE component to the CIC component must be sufficiently rigid to allow the connector to be used to insert and remove the CIC component that is, preferably, positioned deep inside the user's ear canal. *See* A70 (5:46-48); A78 (claim 1). In other words, the claimed hearing aid does not require a separate structure for inserting or removing the CIC component because the connector serves that function. This serves two important purposes that were not met by prior art devices: allowing for ease of insertion and withdrawal of the unit without requiring a separate structure and without making the device more visible to outside observers.

Claim 22 and its dependent claims are directed to a method of providing hearing aid components, including components tailored to a particular user. *See* A79; A5666-68. Claim 22 recites:

A method for providing a plurality of earpiece auditory device components, a portion of which may be assembled to form an earpiece auditory device tailored to a user, said method comprising:

providing a selected behind-the-ear (BTE) component operable to facilitate the user's intended use for the earpiece auditory device may be selected, wherein said BTE component comprises a module including processing circuitry;

providing a selected completely-in-canal (CIC) component, said selected CIC component being shaped to fit into the ear canal of the user, wherein said selected CIC component comprises an ear mold and a speaker, said speaker being encased in a speaker module; and

providing a connector of sufficient length to physically couple said selected BTE component when said selected BTE component is placed behind the ear of the user to said selected CIC component when said CIC component is placed inside the ear canal of the user, wherein said connector of sufficient length includes a proximal end physically and communicatively operable to couple to said BTE component and a distal end physically and communicatively operable to couple to said CIC component, said connector of sufficient length being sufficiently rigid so as to allow said connector of sufficient length to be used to insert and remove said selected CIC component;

wherein said speaker module is detachably physically interconnectable with said ear mold.

A79. As with claim 1, the CIC component includes a speaker encased in a speaker module, and the connector is sufficiently rigid for use in inserting and removing the CIC component. *See id.*

The '562 Patent's dependent claims include additional features relevant to this appeal. Dependent claims 4, 5, 8, 17, 18, and 20 contain an express limitation specifying that particular components of the hearing aids are disposable, meaning that such components are designed to be entirely removed and replaced—as

opposed to repaired—if they were to fail. *See* A78 (21:21-28); A78-79 (claims 4, 5, 8, 17, 18, and 20). For example, the connector is disposable in claim 4, while the speaker module is disposable in claim 5. A78. Dependent claims 13-14 and 32-37 recite a custom ear mold, which the patent states is “individually shaped to fit exactly within the ear canal of a particular user.” A77 (20:25-28); A78-79 (claims 13-14, 32-37).

#### **B. HIMPP Files For *Inter Partes* Reexamination Of The ’562 Patent.**

HIMPP filed for *inter partes* reexamination of the ’562 Patent in February of 2008, seeking reexamination of all claims except claims 10 and 28-29. A1193; A1200. HIMPP’s request included 44 proposed rejections and citations to 14 patents and patent application publications. A1207-08; A1216-26. HIMPP’s cited references included seven patents and patent applications that had been considered by the examiner during prosecution of the application that became the ’562 Patent (A1207-08<sup>1</sup>), including three references that the original examiner had cited in

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<sup>1</sup> The following references were considered by the examiner during prosecution: U.S. Patent No. 2,930,856 (“Toht”); U.S. Patent No. 5,606,621 (“Reiter”); PCT Publication WO 99/07182 (“Shennib”); U.S. Patent No. 5,701,348 (“Shennib ’348”); European Patent No. 0288822; U.S. Patent Application Publication No. 2002/0138237 (“Topholm”); U.S. Patent No. 6,009,183; and Japanese Published Application No. 62-151100. A1207-08.



claim rejections (A1202-04<sup>2</sup>). HIMPP also cited five references that were not of record in the original prosecution. A1207-08.<sup>3</sup>

HIMPP did not allege that any of the cited patents or patent publications anticipate any of the '562 Patent claims, instead alleging obviousness based on various combinations of the cited references. *See* A1147-58.

### **C. The Cited Art.**

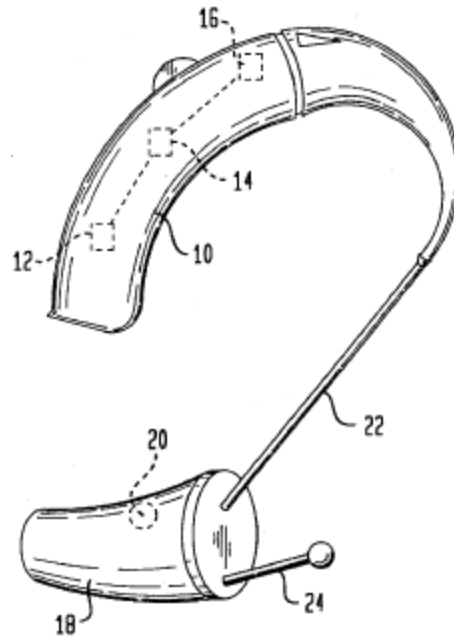
#### **1. Reiter.**

The primary reference relied on in each of the Board's rejections is Reiter. *See* A47-48; *see also* A45-47. Reiter is directed to a hearing aid that includes a BTE component 10, a CIC component 18, wire cable 22 that connects the BTE and CIC components, and a separate retrieval line 24 that is attached only to the CIC component:

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<sup>2</sup> The following references were cited in claim rejections during the original prosecution: Topholm, Shennib '348, and Toht. A1202-04.

<sup>3</sup> The following references were not of record during the original prosecution of the application that became the '562 Patent: U.S. Patent No. 5,046,580; U.S. Patent No. 5,201,007; U.S. Patent No. 3,061,689; U.S. Patent No. 3,080,011; U.S. Patent No. 5,864,628 ("Posen"); and U.S. Patent No. 4,739,512. A1207-08.



A166 (Figure 1); A167 (2:11-23). Wire cable 22 is described as “thin” and “flexible” and is not taught as a means of inserting or removing the CIC component. *See* A167 (2:19-20). Instead, insertion and removal is via retrieval line 24 that protrudes from the CIC component, which directs the user away from grabbing the more fragile wire cable 22. *See* A167 (2:20-27); A4610 (§ 25). Reiter does not teach any other means of inserting or removing the CIC component, and the only means of connecting the BTE and CIC components described by Reiter is the “thin, flexible wire cable 22.” *See* A167 (2:19-20).

A primary goal of Reiter was to reduce electroacoustic feedback in the hearing aid by mechanically separating the microphone from the speaker (or “receiver”). *See* A167 (1:15-21, 1:51-53). Thus, in Reiter, the microphone is located in the BTE component, and the receiver is located in the CIC component,

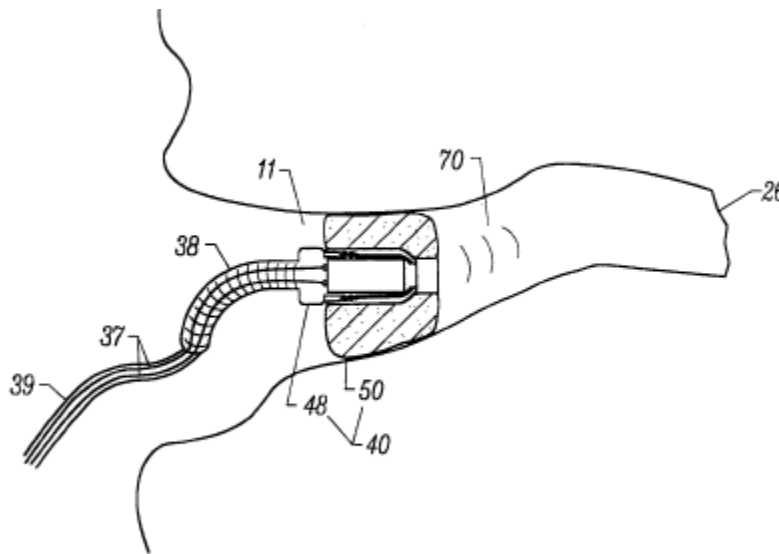
with only the thin wire cable 22 connecting the two. *Id.* (1:40-50, 2:18-20); *id.* (1:51-53) (“Because the BTE and CIC components are mechanically isolated from each other, electroacoustic feedback is greatly reduced.”). Use of a thicker, more rigid material on the connecting wire cable 22 would affect vibration conduction along the connector and electroacoustic feedback in unpredictable ways. *See* A4595 (¶ 14).

Reiter does not teach that any of its components are designed to be disposable and does not mention custom fit ear molds or any hearing aid component tailored to fit a particular user. *See generally* A165-68; *see also* A4611 (¶ 31) (“There is no requirement that the assembly process of Reiter would have to make devices tailored to a user.”).

## **2. Shennib.**

Each of the Board’s rejections also relied on Shennib. *See* A47-48. Shennib is titled “Acoustic Coupler” and is directed to an “intracanal earpiece consisting of a receiver assembly and a replaceable acoustic coupler” (A172) that, in some embodiments, is taught as useful in a hearing aid. Shennib’s “acoustic coupler” is a semi-rigid sleeve that goes over the speaker to improve the fit of the speaker in the ear canal. *See* A176. Two drawings depict different embodiments: Figure 19 depicts a completely-in-canal hearing aid embodiment (with no BTE) whereas Figure 20 depicts an embodiment where an earpiece is connected to an “external

audio device” like a personal stereo system. A178 (“Figure 20 is a coronal view of the ear canal with an earpiece for connection to an external audio device.”); A178-79 (“The earpiece 40 may be part of a canal hearing device 10, *as shown in Figure 19*, or part of an audio system external to the ear canal but coupled, either electrically via a signal cable 39 or by other means, to the earpiece, *as shown in Figure 20.*”) (emphasis added); A4593 (¶ 8) (“[O]ne of ordinary skill in the art would read ‘audio system external to the ear canal’ to refer to a non-hearing aid system, such as a personal stereo system . . .”). Figure 20’s depiction of “an earpiece for connection to an external audio device” is reproduced below:



A178; A205.

The earpiece in Figure 20 includes “handle 38” that “facilitates insertion and removal of the hearing device, as well as providing strain relief for wires 37 within the signal cable 39.” A179. As is readily seen in Figure 20, handle 38 extends

from speaker assembly 48<sup>4</sup> and surrounds the wires 37 that comprise signal cable 39. *See* A205; *see also* A4593 (¶ 9) (“handle 38 is placed concentrically over signal cable 39 to facilitate insertion and removal of the earpiece 40”). Thus, in the external audio device embodiment depicted in Figure 20, the wires and cable that connect the speaker to the external audio device are not themselves used for insertion and removal. Rather, a separate “handle” is used for that purpose and that handle surrounds the cable and is part of and protrudes from the speaker. *See* A179; A4593 (¶ 8) (“Figure 20 of [Shennib] shows handle 38, which is concentrically over, and a separate element from, signal cable 39.”). Hear-Wear also presented evidence that one skilled in the art would understand that the handle 38 and speaker assembly 48 are integrated and mechanically inseparable such that they form one solid structure.<sup>5</sup> Such a configuration is necessary for handle 38 to

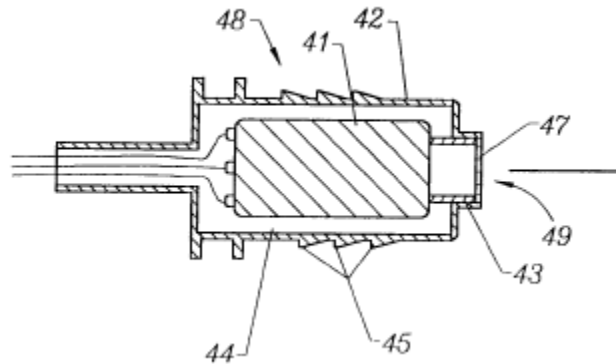
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<sup>4</sup> Shennib uses the terms “speaker” and “receiver” interchangeably. *See* A172 (“[c]oupling sound from a receiver (speaker) into an individual’s ear canal”); A173 (“adequate acoustic sealing within the ear canal to prevent sound leakage from the receiver (speaker) outlet of the device”).

<sup>5</sup> *See* A4610 (¶ 27) (“One of ordinary skill in the art viewing Figure 20 would recognize that the integral formation of handle 38 and speaker assembly 48 provides a structure that is solid.”); A4593-94 (¶ 9) (“One of ordinary skill in the art viewing Figure 20 would understand that the handle 38 is integrated with speaker assembly 48. . . . [S]peaker assembly 48 and the handle 38 are mechanically inseparable and are not intended to be disconnected from one another.”).

“provid[e] strain relief for wires 37 within the signal cable 39.” *See* A179; A4593-94 (¶ 9); A6036.

In Shennib, the only other depiction of the connection between speaker assembly 48 and the signal cable wiring is seen in Figure 3:



A196. Handle 38 is not labeled in Figure 3. But the drawing includes a protruding extension of speaker assembly 48—which includes receiver 41—that surrounds the wires of signal cable 39. *See* A196; A4594 (¶ 12) (“Figure 3 of [Shennib] . . . shows how the signal cable 39 connects to the receiver 41.”). In addition, Shennib states that Figure 3 depicts the earpiece 40 that is shown in Figure 20, *see* A178-79, another indication that the structure protruding from speaker assembly 48 in Figure 3 is akin to the handle 38 illustrated in Figure 20.

Shennib teaches that the entire acoustic coupler or the “acoustic seal” component may be “replaceable” or “disposable,” but does not teach that any *other* component of the earpiece is adapted to be disposable. *See* A176 (“replaceable acoustic coupler”); A178 (“disposable acoustic seals”); A184 (“disposable acoustic

couplers are replaced by the user”). Shennib also does not teach the use of custom fit ear molds. In fact, the only references in Shennib to such custom fit ear molds discourage their use. First, Shennib explains why the process of making a custom earpiece is problematic: “[t]he insertion and removal of the impression material within the deep portion of the ear canal is not only uncomfortable, but potential complications due to hematoma or bleeding may occur.” A174 (citation omitted). Shennib further teaches that even with custom earpieces, gaps between the ear canal and the earpiece are common, and such gaps “are a significant source of acoustic feedback.” *Id.* And that problem cannot be solved by more precise custom fitting because “a tighter fit to minimize gaps and improve sealing is usually accompanied by discomfort, irritation, or even pain, particularly in the bony portion of the canal which is sensitive and more prone to discomfort and irritation.” *Id.* Thus, Shennib states that its invention—acoustic couplers—are the better design because they eliminate the problems of custom molds: “acoustic couplers that seal and conform to a variety of ear canals are desirable because they eliminate the need for impressions and custom fabrication.” A175.

#### **D. Proceedings Before The Examiner And Board.**

The PTO granted reexamination as to claims 1-9, 11-27, and 30-45. A1226. In a first office action, the examiner adopted rejections of all reexamined claims except for claim 21, for which the examiner entered a new rejection different than

those proposed by HIMPP. A1311; A1313-34. During proceedings before the examiner, Hear-Wear canceled claims 42-45 (A1772) and overcame the rejections against claims 13-14 and 32-37 (A2458). Hear-Wear then appealed the rejections of claims 1-9, 11-12, 15-27, 30-31, and 38-41 to the Board. A4548-51. HIMPP also appealed to the Board, seeking reversal of the confirmation of claims 13-14 and 32-37, as well as the examiner's withdrawal of certain rejections proposed by HIMPP. A5639.

Hear-Wear argued, *inter alia*, that all of the rejections were improper because it would not have been obvious to one of ordinary skill in the art to combine the teachings of Reiter with the teachings of Shennib. In brief, Hear-Wear argued that the proposed combination of Reiter and Shennib does not teach the claimed connector that attaches the BTE and CIC components and is sufficiently rigid to facilitate insertion and removal of the CIC component. *See* A4559-62; A6033-39. Hear-Wear also provided several reasons why one of ordinary skill in the art would not combine the teachings of Reiter and Shennib, including increased feedback (which Reiter specifically sought to minimize) and market demands. *See* A4562-68; A6040-43. Hear-Wear provided additional arguments for certain dependent claims, such as claims reciting disposable elements or custom ear molds. *See* A4580-82; A5765-66. Specifically, Hear-



Wear argued that the proposed combinations of references either (1) did not teach those elements or (2) discouraged their use. *See* A4580-82; A5765-66.

Hear-Wear supported its arguments with declaratory testimony from Dr. Wayne Staab and Adnan Shennib, who at the time of their testimony had over 60 years of collective experience in hearing aid development. *See* A4592 (¶ 3); A4604 (¶ 6). Among Dr. Staab's many accomplishments, he obtained a Ph.D. in Hearing and Speech Sciences; was the Executive Director of the American Auditory Society; published extensively in journals in the hearing aid field; testified about hearing aids before the Department of Health, Education, and Welfare; and has "been at the forefront of developing and introducing new hearing aid technology internationally since 1972." A4603-04 (¶¶ 2-6). Mr. Shennib holds a B.S. in electrical and computer science engineering and an M.S. in biomedical engineering. A4592 (¶ 2). He is "an inventor and entrepreneur with over 25 years experience in hearing aid and medical innovations from start-up operations to large, established medical device firms." *Id.* (¶ 3). He is an inventor on over 50 issued patents and 30 pending patent applications, and was a co-inventor of the subject matter of the Shennib patent application that is described above and was relied on by the examiner and the Board in rejecting Hear-Wear's claims. *See* A4593 (¶ 6). Hear-Wear also submitted evidence of objective indicia of nonobviousness. *See, e.g.*, A4710-11; A4569-75.

The Board affirmed the examiner's rejections except as to claims 2 and 23, and entered new rejections against those claims, as well as previously confirmed claims 13-14 and 32-37. A47-48. All rejections relied on the combination of the Reiter and Shennib references.<sup>6</sup> The Board held that it would have been obvious to combine the handle taught by Shennib with the hearing aid taught by Reiter to arrive at the invention claimed in the '562 Patent. *See* A15-20. In determining that there would have been an apparent reason to make that combination, the Board discounted Hear-Wear's evidence of market pressures mandating less conspicuous devices, reasoning that Hear-Wear had not shown that Shennib's "handle would be inoperable or unworkable if implemented in Reiter's device." A19. Regarding Hear-Wear's evidence that the combination may result in increased feedback, the Board determined that this did not "preclude[] combining the teachings of Reiter and Shennib." A20; *see also* A4595 (¶ 14).

As for Hear-Wear's claims directed to specified disposable elements, the Board did not point to any teachings about disposable elements, instead reasoning that the references must be viewed as teaching those elements because they do not

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<sup>6</sup> Specifically, the Board rejected the claims under 35 U.S.C. § 103 as follows: claims 1, 3-9, 11, 12, 19, 20, 22, 24-27, 30, 31, and 41 based on Reiter and Shennib; claims 15-18 and 38-40 based on Reiter, Shennib, and Posen; claims 13, 14, 32, and 37 based on Reiter, Shennib, Toht, and Shennib '348; claims 33-36 based on Reiter, Shennib, Toht, Shennib '348, and Topholm; and claims 2 and 23 based on Reiter, Shennib, and Toht. A47-48.

teach away from using such disposable components. *See* A30 (“We do not discern that Shennib or, for that matter, Reiter imposes any restriction on the components of its hearing device that requires that any component must remain as a part of the device and cannot be removed and replaced.”); A31 (“As with Shennib and Reiter, we do not discern that Posen mandates that any component of its disclosed devices must be maintained and cannot be removed and replaced.”).

For the claims that recite custom ear molds, the Board determined that Shennib did not teach away from using such custom fit components. *See* A40-42. According to the Board, Shennib’s teachings directed to “potential complications due to hematoma or bleeding” and “discomfort, irritation, or even pain” from custom ear molds (A174) did not “criticiz[e], discredit[], or discourage[e] the use of ‘custom’ earmolds” (A41). That is because, according to the Board, “[t]hat Shennib may express generally a preference for a technique that minimizes the possibility of discomfort does not mean that it teaches away from investigation into other techniques.” A42 (citing *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009)). The Board also discounted Hear-Wear’s evidence of objective indicia of nonobviousness. A34-39.

Hear-Wear appealed to this Court after the Board’s decision rejecting the reexamined claims of the ’562 Patent became final. *See* A53-54; A6280-81.

## SUMMARY OF ARGUMENT

The Board's rejections all rely on the combination of the Reiter and Shennib references as allegedly teaching all elements of independent claims 1 and 22 and rendering those claims obvious. Those rejections should be reversed because they are not supported by the teachings of Reiter and Shennib, either alone or in combination, and because the Board failed to properly consider relevant evidence as a result of its application of incorrect legal standards.

First, contrary to the Board's reasoning, Reiter and Shennib do not disclose all elements of the independent claims. Each of Hear-Wear's claims recites a connector that is sufficiently rigid for use in inserting and removing the CIC component, which is positioned completely inside the user's ear canal. However, neither Reiter, Shennib, nor their combination teaches that sufficiently rigid connector. In Reiter, the separate structure for insertion and removal is a retrieval line that is clearly not a connector. Similarly, in Shennib, insertion and removal is via a handle that attaches only to Shennib's earpiece and wraps concentrically around a portion of the signal cable that connects the earpiece to an external audio system. Both the reference and the extrinsic evidence show that the handle is neither a connector nor part of one. Instead, it is a separate structure that extends from the earpiece, as is necessary to provide strain relief to the wires of the signal cable, a function of the handle that was expressly taught in Shennib and noted by

the Board. Because the Board erred in determining that the combination of Reiter and Shennib teaches or suggests Hear-Wear's sufficiently rigid connector, the Board's obviousness rejections fail and must be reversed.

In addition, the hypothetical device formed by combining Shennib's handle with Reiter's hearing aid would lack the "completely-in-canal (CIC) component" recited in Hear-Wear's claims. That is because the handle in the hypothetical Reiter/Shennib device would have to be integrated with and extend from the in-canal component in order to provide the necessary strain relief and rigidity. And this handle extension of the in-canal component would have to protrude from the ear canal into the concha in order to be grasped for insertion and removal of the in-canal component. Thus, the inside-the-ear component in the hypothetical Reiter/Shennib device is not the CIC component recited in Hear-Wear's claims because it is not "completely-in-canal."

Second, even if the proposed combination had addressed all claim limitations, the requisite reason or motivation to combine Reiter's device with Shennib's handle is lacking. The record shows that hearing aid consumers demand the most discreet devices possible, such that a hearing aid designer would not modify Reiter in a manner that increases visibility of the device. But that is precisely what would happen if one were to make the Board's proposed combination. Shennib's handle is thick and bulky and must extend substantially

out of the ear canal in order for a user to grasp it with a thumb and forefinger. The Board did not dispute those facts, instead holding that such aesthetic concerns were irrelevant because the resulting device would be operable. That was legal error. As the Supreme Court has held, market demands are relevant in determining motivation to combine, and that applies whether or not the proposed combination would be operable. The correct question is whether one of ordinary skill in the art would have a reason to make that combination in light of market demands. Here, the record shows that the answer is no. Reiter already had a visually acceptable solution for inserting and removing its CIC component, and there was no reason to make the Reiter device *less* appealing to hearing aid wearers by adding Shennib's obtrusive handle.

There is yet another, functional reason that one of ordinary skill would not use Shennib's handle in Reiter's device. Hear-Wear presented evidence, which the Board did not meaningfully address, that the combination would affect two important features of Reiter's device in unpredictable ways: mechanical isolation and electroacoustic feedback. Because the handle would decrease the desired mechanical isolation between the microphone in the BTE component and the speaker in the CIC component, the record reveals that one would have to perform "considerable experimentation" to investigate the effects on feedback in order to determine whether Shennib's handle could be successfully used with Reiter's

device. The Board erred in failing to properly consider this evidence. Without a reasonable expectation of success in making the combination, there was no apparent reason to combine Reiter and Shennib in the manner urged by the Board.

The deficiencies in the Board's proposed combination of Reiter and Shennib are fatal to all of its obviousness rejections. But the Board also committed additional errors in evaluating dependent claims directed to disposable elements and custom ear molds, such that those rejections should be reversed for independent reasons. For claims that recite particular disposable elements, the Board did not point to *any* teachings of such elements in the prior art. Instead, the Board reasoned that the references must teach disposable elements because they do not teach away from using such elements. But that is not the correct standard. The obviousness inquiry focuses on what the cited references actually teach, and claims cannot be declared obvious based on what a reference does *not* teach.

Finally, the Board reversed the examiner's confirmation of dependent claims that recite custom fit ear molds, disagreeing with the examiner's determination that Shennib teaches away from using such custom pieces. But there is only one reasonable way to interpret Shennib's statements about safety and comfort concerns with custom ear molds, as well as Shennib's expressly stated desire to "eliminate the need" for such ear molds: Shennib expressly discouraged the use of

custom ear molds. Thus, the Board's reversal of the examiner's confirmation of these dependent claims should be reversed for that reason as well.

### STANDARD OF REVIEW

Whether an invention would have been obvious is a question of law that is based on underlying facts. *In re Kotzab*, 217 F.3d 1365, 1369 (Fed. Cir. 2000). This Court reviews the Board's compliance with the governing legal standards and ultimate determination on obviousness *de novo*, while the Board's factual findings are reviewed for substantial evidence. *In re Sullivan*, 498 F.3d 1345, 1350 (Fed. Cir. 2007); *In re Huai-Hung Kao*, 639 F.3d 1057, 1065 (Fed. Cir. 2011). Substantial evidence is "more than a mere scintilla of evidence." *In re Kahn*, 441 F.3d 977, 985 (Fed. Cir. 2006). "The substantial evidence standard requires the reviewing court to ask whether a reasonable person might find that the evidentiary record supports the agency's conclusion." *On-Line Careline, Inc. v. America Online, Inc.*, 229 F.3d 1080, 1085 (Fed. Cir. 2000).

If this Court holds that the Board applied an incorrect legal standard or lacked substantial evidence to support its determinations, the Court can either reverse the Board without remand or remand so that the PTO can reweigh the evidence and make any necessary factual determinations. *See, e.g., Singh v. Brake*, 222 F.3d 1362, 1371 (Fed. Cir. 2000); *In re Baker Hughes Inc.*, 215 F.3d 1297, 1304 (Fed. Cir. 2000).



## ARGUMENT

### I. THE LAW OF OBVIOUSNESS.

A claimed invention is unpatentable “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.” 35 U.S.C. § 103(a) (2010). When assessing whether a patent claim would have been obvious, all claimed limitations are relevant and must be considered. *See In re Wilson*, 424 F.2d 1382, 1385 (CCPA 1970) (“All words in a claim must be considered in judging the patentability of that claim against the prior art.”); Manual of Patent Examining Procedure (“MPEP”) § 2116.01 (“All the limitations of a claim must be considered when weighing the differences between the claimed invention and the prior art in determining the obviousness of a process or method claim.”). If the cited references fail to teach or suggest any of the claim’s limitations, the claim may be found nonobvious. *See Hearing Components, Inc. v. Shure Inc.*, 600 F.3d 1357, 1373-74 (Fed. Cir. 2010) (hearing aid claims were nonobvious where cited references failed to teach claimed “ear piece” and “user-disposable sleeve” elements); *CFMT, Inc. v. Yieldup Int’l Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) (“obviousness requires a suggestion of all limitations in a claim”) (citing *In re Royka*, 490 F.2d 981, 985 (CCPA 1974);

*see also Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966)

(“differences between the prior art and the claims at issue are to be ascertained”).

Moreover, a proposed claim is not obvious merely because “each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). For example, such a claim may be nonobvious when there was no “apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *Id.*; *see also InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, -- F.3d --, 2014 WL 1855416, at \*21 (Fed. Cir. 2014) (“A reason for combining disparate prior art references is a critical component of an obviousness analysis . . . .”). In addition, “[a]n obviousness determination requires that a skilled artisan would have perceived a reasonable expectation of success in making the invention in light of the prior art.” *Amgen Inc. v. F. Hoffman-La Roche Ltd.*, 580 F.3d 1340, 1362 (Fed. Cir. 2009).

The relevant time for assessing whether patent claims would have been obvious is “at the time the invention was made.” 35 U.S.C. § 103(a) (2010). This Court has warned that an obviousness analysis must not rely on hindsight. *See Abbott Labs. v. Sandoz, Inc.*, 544 F.3d 1341, 1348 (Fed. Cir. 2008) (“[T]he obviousness inquiry must ‘guard against slipping into use of hindsight and to resist the temptation to read into the prior art the teachings of the invention in issue.’”) (quoting *Graham v. John Deere*, 383 U.S. at 36); *Grain Processing Corp. v.*

*American Maize-Products Co.*, 840 F.2d 902, 907 (Fed. Cir. 1988) (“Care must be taken to avoid hindsight reconstruction by using ‘the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.’”) (quoting *Orthopedic Equip. Co. v. United States*, 702 F.2d 1005, 1012 (Fed. Cir. 1983)); see also *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1377, 1380 (Fed. Cir. 2012) (vacating obviousness determination based on “prohibited reliance on hindsight”).

The PTO bears the burden to present a *prima facie* case that the claims would have been obvious to one of ordinary skill in the art. See *In re Huai-Hung Kao*, 639 F.3d at 1066. Only if the PTO has made such a *prima facie* showing of obviousness can the burden of production shift to the applicant. See *In re Kumar*, 418 F.3d 1361, 1366 (Fed. Cir. 2005). And, even if the burden of production is shifted, the ultimate burden of proof remains at all times with the examiner and the Board. See *In re Oetiker*, 977 F.2d 1443, 1449 (Fed. Cir. 1992) (Plager, J., concurring) (“The examiner, and if later involved, the Board, retain the ultimate burden of persuasion on the issue.”).

If an independent claim is nonobvious, then its dependent claims are necessarily nonobvious as well. *In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988).

## II. THE COMBINATION OF REITER AND SHENNIB DOES NOT RENDER ANY CLAIM OF THE '562 PATENT OBVIOUS.

### A. The Proposed Combination Of Reiter And Shennib Does Not Include All Claim Limitations.

A key question underlying an obviousness inquiry is “whether the prior art discloses every limitation of the asserted claims.” *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1347 (Fed. Cir. 2012); *see also Woods v. DeAngelo Marine Exhaust, Inc.*, 692 F.3d 1272, 1287 (Fed. Cir. 2012) (upholding verdict of nonobviousness when the challenger “failed to show that the prior art singly or collectively disclosed or taught every limitation of the claims at issue”); *Hearing Components*, 600 F.3d at 1373-74 (hearing aid claims were nonobvious where cited references failed to teach claimed “ear piece” and “user-disposable sleeve” elements). Although, as explained below, the Board also erred in holding that there was the requisite motivation to combine Reiter and Shennib, *see infra* at 37-49, its decision falters before even reaching that issue because neither Reiter, Shennib, nor a combination of them teaches or suggests a key element recited in all claims of the '562 Patent: a connector that is sufficiently rigid to be used to insert the CIC component and remove it from the ear canal.

Each of independent claims 1 and 22—and, accordingly, all other claims in light of their dependencies on claim 1 or 22—recites a “connector” that attaches the BTE component to the CIC component and is sufficiently rigid so as to allow

the connector to be used to insert the CIC component and remove it from the ear canal of the user. A78-79. There is no serious dispute that Reiter's connector, wire cable 22 that attaches the BTE component to the CIC component, is not "sufficiently rigid so as to allow said connector to be used to insert and remove" the CIC component. *See* A166 (Figure 1); A78 (claim 1). Reiter states that the wire cable is "thin" and "flexible" and does not teach that it could be or should be used to insert or remove the CIC component. A167 (2:19-20). Instead, Reiter expressly teaches that insertion and removal is accomplished via a separate retrieval line 24, *id.* (2:24-27), which directs the user away from grabbing the fragile wire cable 22 when inserting or removing the CIC component, A4610 (§ 25). Thus, Reiter does not teach the sufficiently rigid connector recited in Hear-Wear's claims.

Shennib likewise does not teach a connector that is rigid enough to allow insertion and removal of a CIC component. Although the Board cited Shennib's handle 38 as meeting that limitation (*see* A16-17), both the reference itself and extrinsic evidence establish that handle 38 is not a connector at all, or even part of a connector. *See In re Kotzab*, 217 F.3d at 1370-71 (reversing the Board's obviousness determination because, among other reasons, the reference relied on by the Board did not teach the limitation for which it was cited). Rather, it is just what its name suggests: a "handle," not a connector. In this respect, Shennib is no

different from Reiter; rather than using the connecting wires as the insertion and retrieval devices, as the '562 Patent does, both Shennib and Reiter accomplish that function with separate protruding handles that are fixed to the CIC component.

Shennib identifies a handle for inserting and retrieving a speaker component in Figure 20, which is directed to an embodiment for coupling the speaker to an external audio device such as a personal stereo player. *See supra* at 11-13. In that drawing, signal cable 39 is the element that actually connects the earpiece of Shennib to an external audio device. *See* A178-79; A205. As the drawing itself shows, handle 38 is not that connector. Rather, the handle is placed concentrically ***around*** a portion of the signal cable, and it is the signal cable that actually connects the earpiece and external audio device. *See* A205; A4593 (¶ 9). Rather than being part of the connector, the handle is part of the speaker assembly 48 that is one component of the earpiece. Indeed, even the Board itself expressly found that the handle is “fixed to earpiece 40 in a manner that is not viewed as detachably coupled . . . .” A16. Moreover, Hear-Wear presented evidence, including testimony from the first-named inventor on the Shennib reference, further confirming that the handle is part of the speaker assembly.<sup>7</sup> Accordingly, much

<sup>7</sup> See A4593-94 (¶ 9) (“One of ordinary skill in the art viewing Figure 20 would understand that the handle 38 is integrated with speaker assembly 48. . . . [S]peaker assembly 48 and the handle 38 are mechanically inseparable and are not intended to be disconnected from one another.”); A4610 (¶ 27) (“One of

like Reiter, Shennib teaches inserting and removing the earpiece via a rigid handle attached to the speaker assembly, rather than through the sufficiently rigid connector that is recited in Hear-Wear's claims.

This is further made clear by Shennib's teaching that handle 38 "provid[es] strain relief for wires 37 within the signal cable 39." A179. If handle 38 were part of the signal cable 39 (rather than part of the speaker assembly), it could not and would not provide strain relief to the wires within the connecting signal cable. That is because the forces placed on the handle when inserting or removing the earpiece would still be applied to the connector wires and cable. That does not happen in the device taught by Shennib because the handle and speaker assembly form a solid structure, which protects the signal cable and the wires that comprise it from absorbing the pushing and pulling forces applied by the user. *See* A4593-94 (¶ 9); A4610 (¶ 27). In other words, it is the handle's continuity with the speaker assembly that allows the handle to provide the strain relief function that is expressly taught by Shennib. *See* A179. This is the same kind of strain relief afforded by Reiter's retrieval line.

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ordinary skill in the art viewing Figure 20 would recognize that the integral formation of handle 38 and speaker assembly 48 provides a structure that is solid.").

The Board nevertheless accepted HIMPP's argument that the "handle 38, as well as wires 37 and cable 39, is distinct from the component that is earpiece 40, such that the handle and earpiece are not a single structure regarded as 'unitary.'"

A17. This precise point, however, is immaterial. As noted, even the Board agreed that the handle in Shennib is "fixed to earpiece 40." A16. And whether or not the handle and earpiece are a single unitary structure says nothing about the key issue before the Board, which is whether the handle constitutes a *connector* that connects the earpiece to the BTE component.

The Board also credited HIMPP's declaration testimony that "cable 39, wires 37, and handle 38 . . . collectively form[] a 'connector' between an in-canal device and an external audio device." A17. The Board's citations, however, do not provide substantial evidence for its conclusion that Shennib's "handle" equates to the sufficiently rigid connector recited in the '562 Patent. The plain and obvious meaning of a "connector" is a "device[] for connecting one object to another."<sup>8</sup> In the '562 Patent and the prior art, the two things being connected are the in-canal component and audio output components. In Shennib's Figure 20, the cable and wires unquestionably constitute connectors because they are attached to both the earpiece and the external audio device. *See* A205. But nothing in Shennib states

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<sup>8</sup> *See Dictionary.com Unabridged*, Random House, Inc. (<http://dictionary.reference.com/browse/connector>).



or even intimates that the handle is attached to the external audio device, or is even attached to the cable and wires that form the connection between the earpiece and the audio device. Indeed, as already noted, the only thing that Shennib teaches about the handle is that it “provid[es] strain relief for wires 37 within the signal cable 39,” A179, making clear that the handle is separate from the wires and cable. Given that the handle neither connects to the audio device nor is even attached to anything that connects to that device, it simply cannot equate to the sufficiently rigid connector claimed in the ’562 Patent, and the Board’s determination should be reversed for that reason alone. *See, e.g., In re McNeil-PPC, Inc.*, 574 F.3d 1393, 1400-01 (Fed. Cir. 2009) (reversing Board’s anticipation holding when the prior art reference’s drawings revealed that it did not teach the claimed limitation).

The declarations credited by the Board (A17) do not provide substantial evidence to the contrary. First, the Thompson declaration merely stated in relevant part that in Figure 20 of Shennib “the cable 39 passes through handle 38, which combine to form the end of Shennib’s connector.” A5719 (¶ 36). Dr. Thompson was correct that the cable “passes through” the handle, but that just confirms that the cable, not the handle, is the actual connector. Because the connecting cable merely passes through the handle, it is not attached to the handle. Second, in the cited portion of the Fletcher declaration, the witness merely made the conclusory statement that “[i]t is accurate to characterize [the] configuration including the

signal cable 39, wires 37 and handle 38 as a ‘connector’ between the receiver/coupler assembly and the external audio source.” A5734 (¶ 9). Nowhere does Mr. Fletcher explain how the handle can be part of the connector when it neither connects to the external audio source nor is attached to the cable that is the connection to that device. This Court has held that “[g]eneral and conclusory testimony” that prior art includes an element of a patented invention “does not suffice as substantial evidence of invalidity.” *Koito Mfg. Co. v. Turn-Key-Tech, LLC*, 381 F.3d 1142, 1152 (Fed. Cir. 2004) (reviewing district court verdict on anticipation); *see also MEHL/Biophile Int’l Corp. v. Milgraum*, 192 F.3d 1362, 1366-67 (Fed. Cir. 1999) (affirming summary judgment of anticipation when “expert testimony contradicting the plain language of the reference [did] not create a genuine issue of fact”).<sup>9</sup> Accordingly, the conclusory declarations relied on by

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<sup>9</sup> The Supreme Court and this Court have similarly made clear, in the context of claim construction, that testimony that conflicts with a patent or patent application’s own teachings is not substantial evidence. *See Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 390 (1996) (expert testimony must be evaluated in a manner that “fully comports with the specification and claims” and “preserve[s] the patent’s internal coherence”); *DESA IP, LLC v. EML Techs., LLC*, 211 F. App’x 932, 936-37 (Fed. Cir. Jan. 4, 2007) (“Expert testimony in conflict with the intrinsic evidence, however, should have been accorded no weight.”) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1318 (Fed. Cir. 2005) (en banc) and *Markman*, 517 U.S. at 390) (A7004); *see also Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1475 (Fed. Cir. 1998) (en banc, Rader, J. concurring in the judgment) (“Of course this relevant testimony [of one of skill in the art] must not conflict with or attempt to trump contemporaneous intrinsic evidence from the patent document

the Board are not substantial evidence that Shennib teaches a sufficiently rigid connector for inserting and retrieving a CIC component, where the reference itself is clear that the handle is neither a connector nor part of one.

For similar reasons, the combination of Reiter and Shennib also fails to teach or suggest the sufficiently rigid connector recited in Hear-Wear's claims. If one of ordinary skill were to use Shennib's handle on Reiter's device either to provide strain relief (as suggested by the Board, A19) or to provide the rigidity required to insert and remove the in-canal component (as required by the '562 Patent claims), it would be necessary to mold the handle to the in-canal component. *See supra* at 30-31 & n.7. Thus, as in Shennib, the handle in the combined Reiter/Shennib device would extend from the in-canal component and wrap around a portion of wire cable 22. In this hypothetical device, there is no sufficiently rigid connector. The "connector" is wire cable 22, which is the segment that connects the BTE and in-canal components, but that cable is not sufficiently rigid for use in inserting and removing the in-canal component. *See supra* at 29. And although the handle of the hypothetical Reiter/Shennib device would be sufficiently rigid, it is not the connector, or even part of the connector.

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itself . . . .") (citing *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582-83 (Fed. Cir. 1996)).

It is merely an extension of the in-canal component that surrounds a portion of the connector.

Even further, the hypothetical Reiter/Shennib device does not teach or suggest the “completely-in-canal (CIC) component” recited in Hear-Wear’s claims, A78-79. As explained above, the handle in the hypothetical device would have to be integrated with and extend from the in-canal component in order to provide the necessary strain relief and rigidity. In addition, the handle portion of the in-canal component would need to extend outside the ear canal to be used to insert or remove that component. *See infra* at 39-40 & n.11; A4609 (¶23); A4594 (¶11); A4560. Thus, the inside-the-ear component in the hypothetical Reiter/Shennib device is not “completely-in-canal,” as required for the CIC component in Hear-Wear’s claims.

Because neither Reiter, Shennib, nor the combination of the two references teaches or suggests all of the limitations in Hear-Wear’s independent claims, the Court should reverse the Board’s finding of obviousness. *See Hearing Components*, 600 F.3d at 1373-74; *In re Kotzab*, 217 F.3d at 1370-71; *In re Fine*, 837 F.2d at 1076 (“Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.”).

**B. There Was No Apparent Reason To Combine Reiter And Shennib.**

Even if the connector of the '562 Patent could be found in Reiter or Shennib or their combination, the Board further erred in holding that Hear-Wear's claims are obvious, because there was no apparent reason for one of ordinary skill in the art to even make that combination. *See KSR*, 550 U.S. at 418; *InTouch Techs.*, -- F.3d --, 2014 WL 1855416, at \*21. In holding otherwise, the Board made two key legal errors. First, the Board applied an incorrect legal standard by disregarding evidence that one skilled in the art would not be motivated to employ a combination that would result in a more conspicuous hearing aid, on the ground that such an undesirable device could still operate as a hearing aid. Second, the Board failed to fully consider Hear-Wear's argument that one skilled in the art would not be motivated to employ the proposed combination without undue experimentation because the combination may increase vibration and therefore cause unwanted feedback.

**1. The Board Erred In Failing To Evaluate Evidence That The Proposed Combination Would Have Been Aesthetically Undesirable.**

The record confirms that at the time of Hear-Wear's invention, the commercial success of a hearing aid depended to a large extent on how inconspicuous it was. This undisputed principle was repeatedly emphasized in both the cited art (including references relied on by the Board) and the declaratory

evidence. In large part to avoid potential social stigma, users of hearing aids overwhelmingly favor devices that cannot be discerned by outside observers.<sup>10</sup> Even Shennib, which was cited in each of the Board’s rejections, recognizes the importance of cosmetic considerations when designing a hearing aid. *See* A174 (“For cosmetic reasons, consumers demand the smallest possible devices, as evident by the dramatic increase in the use of canal devices versus larger behind-the-ear alternatives.”); *see also* A177 (“any added length of rigid material is likely to jeopardize safety, comfort, or cosmetic acceptance of the earpiece”).

Because of these market demands to provide hearing aids that are as discreet and inconspicuous as possible, one skilled in the art would not modify a hearing

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<sup>10</sup> *See* A164 (Toht describing a “hearing aid receiver which can be worn practically invisibly” and a connector “construct[ed] as to be also extremely inconspicuous if not invisible”); A530 (Because of “the stigma and self consciousness associated with [hearing loss],” “smaller hearing devices which are cosmetically less visible are increasingly sought after.”); A1751-52 (study demonstrating that wearing a visible hearing aid promoted negative impressions regarding “achievement, intelligence, personality, appearance, and socioeconomic status”); A1753 (study showing that less visible hearing aids are more likely to be purchased); A1907 (¶ 11) (“It is very important to users of BTE hearing devices that such devices are [discreet].”); A4606 (¶ 12) (“Patients have always looked for hearing aids that were cosmetically appealing, meaning that they were as inconspicuous as possible given the current technology.”); A4609 (¶ 21) (“In the hearing aid arts, it is important that the various parts of a given hearing aid are not visible to a casual observer or, at the most, only slightly visible. Patients desire hearing aids that are very [discreet], and those who design and build hearing aids endeavor to make products that satisfy the expectations of patients. Therefore, changes to a particular design must not cause such design to have increased visibility.”).

aid design in a manner that makes it *more* visible. But that is exactly what would result if Shennib's handle were combined with Reiter's device. *See* A4609 (¶ 21) ("Handle 38 of Figure 20 of Shennib would be quite visible when the receiver is placed in the user's ear canal . . . ."). The handle would make Reiter's device more visible for at least two reasons. First, the handle would have to be relatively thick in order to completely surround the wire cable and provide the strain relief necessary to protect the wires. *See id.* (¶ 22) ("[H]andle 38 is concentrically placed over at least three wires, thereby making handle 38 fairly thick. Also, handle 38 would need to be stiff in order to be able to be grasped, and would also need to be stout in order to provide strain relief for signal cable 39, and would therefore be thick."); *see also* A205; A196.

Second, the handle would have to protrude substantially outside the ear canal into the concha in order to be grasped and used to remove the CIC component. If Shennib's handle were used to remove a CIC component, it must extend outside the ear canal far enough so that a user could grasp it using a thumb and forefinger. *See* A4609 (¶ 23) ("Handle 38 would need to stick out to nearly the edge of the concha to be properly graspable. A user grasping handle 38 should grasp near the middle of handle 38 so as to avoid grabbing signal cable 39 and to get a good hold on handle 38."); A4594 (¶ 11) ("Referring to Figure 20 of [Shennib], handle 38 is substantially positioned in the concha, which is part of the

external ear, but not part of the ear canal.”); A4560 (overlying Shennib’s Figures 1 and 20 to demonstrate that Figure 20 shows the handle extending outside the ear canal into the concha).<sup>11</sup> Thus, “[t]he thickness of handle 38, as well as the extent to which handle 38 protrudes into the concha, combine to make handle 38 a visible element.” A4609 (¶ 23).

Accordingly, the record demonstrates that because Shennib’s handle would make Reiter’s device more conspicuous and visible, one of ordinary skill in the art would not be motivated to make that combination. *See* A4610 (¶ 24) (“The high visibility of handle 38 would ruin cosmetics of a hearing aid system because handle 38 would be too conspicuous for patients to accept. One of ordinary skill in the art would not accept handle 38 for use in the Reiter device because low visibility is a main goal of hearing aid design.”); *see also* A4609 (¶ 22). As compared to Shennib’s handle 38, the mechanism that Reiter employs for insertion and removal, retrieval line 24, is much more discreet. *See* A4594 (¶ 13); A4609 (¶ 24). It is therefore immaterial whether “a person of ordinary skill in the art would have appreciated that each of Shennib’s handle and Reiter’s retrieval line is available as [an] option[] that allow[s] for handling of a hearing device.” A19.

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<sup>11</sup> *See also* A4609-10 (¶ 24) (“The handle 38 would have to stick out at least 5 mm more from the aperture of the ear canal to be able to be grasped correctly than would retrieval line 24 of Reiter.”); A4594 (¶ 13) (“The handle 38 . . . substantially protrudes from the ear canal for easy grasping.”).



Even if a skilled artisan were motivated to add a different retrieval structure to Reiter's device (which would be unnecessary because Reiter already has a retrieval structure that is inconspicuous),<sup>12</sup> one would not choose Shennib's handle.

Importantly, the Board did **not** dispute that Shennib's handle would increase visibility of the device.<sup>13</sup> Instead, the Board found the point immaterial for the following reason: "That Reiter's retrieval line may have a more desirable aesthetic than Shennib's handle does not convey that the handle **would be inoperable or unworkable** if implemented in Reiter's device." A19 (emphasis added). This is the wrong legal test. The correct question is "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418; *see also InTouch Techs.*, -- F.3d --, 2014 WL 1855416, at \*21. And the Supreme Court has explained that "the effects of demands known to the design community or present in the marketplace" is an important consideration when answering that question. *KSR*, 550 U.S. at 418; *see*

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<sup>12</sup> See A4663 (¶ 22) ("One of ordinary skill in the art would not arbitrarily add an additional component, such as the handle of Shennib, to a hearing aid device if there is already sufficient structure on the device to facilitate the desired functionality.").

<sup>13</sup> HIMPP's declarant, Mr. Fletcher, stated that "handle 38 can be quite thin and non-bulky to achieve its function." A5735 (¶ 12). However, unlike Hear-Wear's experts, Mr. Fletcher did not provide any reasoning to support his conclusion. See A5734-35 (¶ 12). And the Board did not credit this conclusory statement in reaching its decision.

*also Crocs, Inc. v. Int’l Trade Comm’n*, 598 F.3d 1294, 1308 (Fed. Cir. 2010)

(reversing Commission’s obviousness determination based in part on grounds that the alleged combination would “cause[] discomfort for a wearer”). It was therefore legal error for the Board to have disregarded clear evidence that the marketplace and the design community would not have favored a connector that rendered the device more conspicuous, simply because a hearing aid would have worked with that undesirable feature.

Here, the record makes clear that the hearing aid design community and marketplace demanded smaller, inconspicuous hearing aids and that in light of those market demands, one of ordinary skill in the art would not combine Shennib’s handle with Reiter’s device because the resulting hearing aid would be less conspicuous and more visible than Reiter’s unmodified device. The fact that such a device would work as a hearing aid in no way detracts from this conclusion, because it would not work in the way demanded by the market. In conducting the obviousness inquiry, the question is whether one skilled in the art would have been motivated to modify Reiter, with its relatively unobtrusive retrieval line, by employing the more obtrusive handle of Shennib. The evidence showed that one skilled in the art would not be motivated to modify Reiter’s device so as to make it less appealing to consumers, regardless of whether it would still operate.

There are myriad ways that hearing aids could be modified without making them “inoperable or unworkable,” A19. For example, a designer could use larger and more powerful amplifiers. But the record established that one skilled in the art would not be motivated to explore such modifications if, as with Shennib’s handle, they rendered the device more conspicuous. The Board erred as a matter of law in refusing to consider this evidence merely because the modified device would work as a hearing aid. *See In re Sullivan*, 498 F.3d at 1352 (Board “declined to give any meaningful consideration” to declaration evidence of nonobviousness, and “[b]y failing to consider the submitted evidence, the Board thus committed error” because “the Board must give the declarations meaningful consideration before arriving at its conclusion”); *see also Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1361 (Fed. Cir. 2011) (“[T]he claimed invention is not obvious if a person of ordinary skill would not select and combine the prior art references to reach the claimed composition or formulation.”); *Hearing Components*, 600 F.3d at 1374 (affirming verdict of nonobviousness when the patent owner provided “particular reasons why one skilled in the art would not have been motivated to combine the references”).

Moreover, Shennib’s handle was expressly identified in a different context—external audio devices such as personal stereos—where visual obtrusiveness is not the overriding consideration that it is for hearing aids. As

noted above, Shennib's handle is expressly depicted in its drawing of a system for connecting an earpiece to such an external audio device, and is not expressly depicted in connection with a hearing aid. Specifically, Figure 19 (which does not depict handle 38) shows a completely-in-canal hearing aid without a BTE or connector, while Figure 20 (which does show handle 38) is directed to use of Shennib's device with an external audio system.<sup>14</sup> Accordingly, at best, Shennib suggests that handle 38 is suitable for use with an external audio system, such as a personal stereo system, but does not suggest such use in a hearing aid. *See* A4593 (¶ 8). This distinction is not at all surprising. While a user may not be overly concerned about the visibility of a handle in earpiece speakers for a personal stereo system (such as, for example, a modern MP3 player), those who are hearing impaired are quite concerned about the visibility of their hearing aids and the associated stigma it might connote. *See supra* at 37-38 & n.10.

Finally, in an attempt to avoid the visual aesthetic problems with its proposed combination of Shennib and Reiter, the Board cited strain relief as an

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<sup>14</sup> *See supra* at 11-12; A178-79 ("earpiece 40 may be part of a canal hearing device 10, as shown in Figure 19, or part of an audio system external to the ear canal but coupled, either electrically via a signal cable 39 or by other means, to the earpiece, as shown in Figure 20"); A178 ("Figure 19 is a coronal view of the ear canal showing a canal hearing device with an earpiece; and Figure 20 is a coronal view of the ear canal with an earpiece for connection to an external audio device.").

independent, functional reason to combine. *See* A19. This consideration cannot cure the Board's legal error in failing to meaningfully assess the relevant evidence that skilled artisans would not be motivated in the first place to make a visually conspicuous modification. But regardless, there would have been no reason to modify Reiter in an effort to provide strain relief to the wires in Reiter's connector. That is because Reiter's connector, which consists of a thin wire cable, is not used to insert or remove the CIC component. That is the function of the retrieval line. *See* A167 (2:24-27); A4610 (¶ 25). Thus, there would have been no need to use Shennib's handle 38 to provide strain relief to Reiter's connector, because Reiter's connector was not the subject of any strain in the first place.<sup>15</sup>

Accordingly, the Board erred in disregarding the evidence that market considerations would have dissuaded a hearing aid designer from combining

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<sup>15</sup> *See, e.g., Ex parte Mitchell*, No. 2010-003793, slip op. at 4 (BPAI July 1, 2011) (reversing obviousness rejection, and finding Examiner had provided "no articulated reasoning" for proposed combination where reference had "already solved" the problem attributed to it by the Examiner) (A7011); *Ex parte Rinkevich*, No. 2007-1317, slip op. at 8-9 (BPAI May 29, 2007) (noting that "the problem proffered by the Examiner is already solved" by the primary reference, and explaining that "a person of ordinary skill in the art having common sense at the time of the invention would not have reasonably looked to [a secondary reference] to solve a problem already solved by [the primary reference].") (emphasis omitted) (A7021-22).

Reiter's device with Shennib's handle. The Board's determination should therefore be reversed. *See, e.g., In re Sullivan*, 498 F.3d at 1352.

## **2. The Board Erred In Failing To Fully Consider The Mechanical Drawbacks Of The Proposed Combination.**

In addition, the Board erred by failing to fully consider Hear-Wear's argument that one skilled in the art would not have been motivated to combine Shennib's handle with Reiter's device with the requisite expectation of success, because such a combination would decrease mechanical isolation, which could cause unwanted feedback.

Reiter emphasizes the importance of mechanically isolating the microphone in the BTE component from the speaker in the CIC component in order to minimize electroacoustic feedback. *See* A167 (1:15-21, 1:40-53, 2:18-20). Thus, one of ordinary skill in the art would not be motivated to modify Reiter in a manner that would decrease the desired mechanical isolation and increase the undesired feedback. But as Hear-Wear explained before the PTO, that is what may happen if one were to combine Shennib's handle with Reiter's device. Mr. Shennib opined that use of a handle that is rigid enough for insertion or removal of a CIC component would alter Reiter's mechanical isolation and vibration conduction along the connector in a manner that would be expected to affect the level of feedback experienced by the user. *See* A4595 (¶ 14). In light of this evidence, one of ordinary skill in the art would not have a reasonable expectation

that handle 38 could be successfully employed in Reiter's device. *See id.*; *Amgen*, 580 F.3d at 1362 ("An obviousness determination requires that a skilled artisan would have perceived a reasonable expectation of success in making the invention in light of the prior art.").

The Board did not reject this argument on its merits. Rather, the Board stated, without any further substantive analysis, that Hear-Wear did "not articulate the basis for [its] speculation" that Shennib's handle and Reiter's retrieval line may act differently with respect to transmission of vibration, and that "[e]ven if the assertion is true, Hear-Wear [did] not explain why some difference involving vibration transmission somehow precludes combining the teachings of Reiter and Shennib." A20. These holdings were mistaken.

First, Hear-Wear did not merely provide baseless "speculation" on this point. Rather, Hear-Wear predicated the argument on the testimony of Mr. Shennib, who explained that his handle and Reiter's retrieval line "function differently with respect to transmission of vibration" because the handle transmits vibration directly to the signal cable that is inside the handle, whereas Reiter's retrieval line has no direct vibration conduction because the line is not in contact with any structure connecting the CIC and BTE components. A4595 (¶ 14). He further stated that one of ordinary skill in the art would not view the handle and retrieval line as equivalents in light of this effect on mechanical isolation and

“would understand that the use of handle 38 with the device of Reiter would affect mechanical isolation, and considerable experimentation would need to be performed to determine the effect of vibration conduction on feedback before adapting the handle 38 for use with Reiter’s BTE component.” A4595 (¶ 14).

Second, Hear-Wear explained that this evidence demonstrated that “one of ordinary skill in the art would not see the handle 38 and retrieval line 24 as equivalents with respect to mechanical isolation, at the very least, without more information that is not available either in Reiter or Shennib.” A4564 (citing A4595 (¶ 14)). As Hear-Wear noted, based on Mr. Shennib’s testimony, one of skill in the art would understand that employing Shennib’s handle may affect the mechanical isolation of Reiter’s device and that “Reiter discusses mechanical isolation as important in reducing feedback.” A4564 n.8 (citing Reiter, col. 1 at lines 40-61).

The Board erred in failing to fully consider Hear-Wear’s argument and cited evidence. An obviousness determination “requires that a skilled artisan would have perceived a reasonable expectation of success in making the invention in light of the prior art.” *Amgen*, 580 F.3d at 1362. And the Board bears the burden of proving the requisite expectation of success. *See In re Rinehart*, 531 F.2d 1048, 1053-54 (Fed. Cir. 1976) (reversing the Board’s obviousness determination when it “did not meet the requirement of establishing some predictability of success in any attempt to combine elements of the reference processes”). Here, the Board failed



to properly evaluate Hear-Wear's evidence that those skilled in the art would not have been motivated, without considerable further experimentation, to adopt modifications that would decrease mechanical isolation and thereby increase feedback, on the erroneous view that the argument was predicated solely on baseless speculation.

Accordingly, the Board's decision should be reversed. *See Institut Pasteur & Universite Pierre et Marie Curie v. Focarino*, 738 F.3d 1337, 1345 (Fed. Cir. 2013) (prior art reference that warned of particular drawbacks in adopting an untested modification "count[ed] significantly against finding a motivation to take the claimed steps with a reasonable expectation of success").

### **III. CLAIMS 4-5, 8, 13-14, 17-18, 20, AND 32-37 ARE NONOBVIOUS FOR ADDITIONAL REASONS.**

As explained above, the rejections of claims 4-5, 8, 13-14, 17-18, 20, and 32-37 should be reversed in light of the deficiencies in the proposed combination of Reiter and Shennib. But in addition, the record demonstrates that those claims are also nonobvious for independent reasons, and the Board erred in rejecting those separate arguments.

#### **A. The Board Erred In Holding That The Prior Art Included Disposable Components.**

Dependent claims 4, 5, 8, 17, 18, and 20 contain express limitations specifying that particular components of the hearing aids are disposable, meaning

that such components are designed to be entirely removed and replaced if they should fail. *See* A78 (21:21-28); A78-79 (claims 4, 5, 8, 17, 18, and 20). These embodiments ensure that users will not be without the hearing aid while a particular component of the device is being repaired. *See* A76 (17:58-18:20). The user could instead simply acquire a replacement part for the defective component. *See id.*; *see also* A78 (21:21-28). In the proceedings before the PTO, Hear-Wear argued that the cited references did not teach this required element of the '562 Patent and, therefore, that the dependent claims were nonobvious.

In rejecting this argument and finding the dependent claims invalid, the Board did not point to anything in the cited references teaching disposable elements. Instead, the Board reasoned that it was sufficient that the references did not preclude using disposable elements. As the Board stated, “[w]e do not discern that Shennib or, for that matter, Reiter imposes any restriction on the components of its hearing device that requires that any component must remain as a part of the device and cannot be removed and replaced.” A30; *see also* A31 (“As with Shennib and Reiter, we do not discern that Posen mandates that any component of its disclosed devices must be maintained and cannot be removed and replaced.”).

This was legal error. As noted, an obviousness inquiry looks to “whether the prior art discloses every limitation of the asserted claims.” *Transocean*, 699 F.3d at 1347; *see also Woods*, 692 F.3d at 1287. The Board, however, pointed to

nothing in the cited prior art references that disclosed, either expressly or implicitly, the disposable component limitation that is expressly taught in dependent claims of the '562 Patent. Instead, the Board simply noted that the prior art did not expressly preclude the possibility that their devices might be made of disposable components. That will not do. A reference does not disclose a particular limitation merely because it does not preclude it. For a prior reference to be relevant to the obviousness inquiry as to these dependent claims, it must actually disclose the limitation. *See, e.g., Hearing Components*, 600 F.3d at 1373-74 (hearing aid claims were nonobvious when the cited references failed to teach the claimed “ear piece” and “user-disposable sleeve” elements).<sup>16</sup>

The proper analysis focuses on what the references actually teach, and here, the Board did not show that the cited art teaches the limitations recited in Hear-Wear’s dependent claims. Quite to the contrary, the Shennib reference contains dependent claims expressly teaching that *two* of its elements—its “acoustic coupler” and “acoustic seal”—may be “disposable” or “replaceable” (*see* A178;

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<sup>16</sup> When considering the analogous inquiry as to whether there is a motivation to combine references, the Supreme Court has held that “when the prior art teaches away from combining certain known elements,” discovery of a successful means of combining them is “more likely” to be nonobvious.” *KSR*, 550 U.S. at 416. It follows, then, that a claim can still be found nonobvious even where the prior art does not expressly teach away from it. Similarly, a reference that does not disclose a claimed limitation does not demonstrate its obviousness merely because that reference does not expressly teach away from it.

A184, A187 (claims 4 and 5)), but Shennib does not teach that any *other* component has that feature. This would lead one of ordinary skill to conclude that the other components taught by Shennib were *not* contemplated as being disposable. *See Phillips*, 415 F.3d at 1314-15 (“[T]he presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.”). Thus, claims 4, 5, 8, 17, 18, and 20, which recite specified disposable elements, were not shown to be obvious because the Board failed to identify any prior art teaching those limitations.

Nor could the Board’s decision on this point be saved by relying on a theory of inherency, i.e., that the prior art should be read as inherently including the limitation even though it does not expressly reference it. Under that theory, a *prima facie* case of obviousness cannot be established based on a reference’s failure to teach away from a claimed limitation. Rather, “[t]o establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is *necessarily* present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (internal quotation marks omitted; emphasis added); *see also Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1269 (Fed. Cir. 1991) (“Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not

sufficient.”) (quoting *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981)). Here, the Board did not find that the components of Shennib were inherently disposable. Nor could it have done so. Indeed, as already noted, by including the limitation of a disposable acoustic coupler in a dependent claim, Shennib itself makes clear that its components are not necessarily disposable. *See supra* at 51-52.

Accordingly, the Board failed to sustain its burden to prove that Hear-Wear’s disposable component limitations of claims 4, 5, 8, 17, 18, and 20 were present in the prior art, and its decision finding those claims invalid as obvious should therefore be reversed.

**B. The Board Erred In Holding That The Prior Art Did Not Teach Away From The Use Of A Custom Ear Mold.**

Dependent claims 13-14 and 32-37 recite a custom ear mold, which the patent describes as an ear mold that is “individually shaped to fit exactly within the ear canal of a particular user.” A77 (20:25-28); A78-79 (claims 13-14, 32-37). The patent examiner confirmed patentability of those claims because Shennib teaches away from the use of a custom fit ear mold. *See* A2458. Specifically, Shennib teaches that the process of making a custom earpiece is “uncomfortable” and has “potential complications due to hematoma or bleeding.” A174. Shennib further teaches that a tight-fitting custom piece, which is necessary to minimize the gaps that cause electroacoustic feedback, “is usually accompanied by discomfort, irritation, or even pain.” *Id.* Thus, it is “desirable” to “eliminate the need for

impressions and custom fabrication.” A175. The Board incorrectly determined that those statements did not constitute a teaching away. *See* A41-42.

“A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *DePuy Spine*, 567 F.3d at 1327 (quoting *Ricoh Co., Ltd. v. Quanta Computer Inc.*, 550 F.3d 1325, 1332 (Fed. Cir. 2008)). At a minimum, Shennib’s teachings regarding “potential complications due to hematoma or bleeding” and “discomfort, irritation, or even pain,” A174, would lead one of ordinary skill in the art “in a direction divergent from the path” that Hear-Wear took in employing custom ear molds. *See id.* Contrary to the Board’s statement that Shennib did not “criticiz[e], discredit[], or discourage[e] the use of ‘custom’ earmolds,” A41, the only reasonable way to interpret Shennib’s statements about safety and comfort concerns is that Shennib discouraged the use of custom ear molds.

According to the Board, “[t]hat Shennib may express generally a preference for a technique that minimizes the possibility of discomfort does not mean that it teaches away from investigation into other techniques.” A42. But Shennib did far more than simply express a general preference for a technique that minimizes discomfort. Shennib affirmatively discouraged the use of custom fit ear molds.

After reciting the many problems with such molds, Shennib states that its invention, an acoustic coupler, should be used instead of a custom mold: “acoustic couplers that seal and conform to a variety of ear canals are desirable because they *eliminate the need for impressions and custom fabrication.*” A175 (emphasis added). Thus, the Board was simply mistaken when it stated that Shennib “does not convey that such custom ear pieces are undesirable as compared with non-custom ear pieces,” A42. Shennib touted its own invention in part because it “eliminate[d] the need” for custom pieces. A175.

Accordingly, the Board’s reversal of the examiner’s confirmation of claims 13-14 and 32-37 should be reversed because the Board erroneously discounted evidence that the prior art taught away from the claimed invention. *See KSR*, 550 U.S. at 416 (“[W]hen the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious.”).

## CONCLUSION

For the foregoing reasons, the Court should reverse the judgment of the Board.

Respectfully submitted,

/s Jonathan S. Franklin

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May 19, 2014

Counsel for Appellant



## **ADDENDA**

- (1) Decision of the Patent Trial and Appeal Board
- (2) Order Regarding Finality of the Board's Decision
- (3) U.S. Patent No. 7,110,562



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The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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K/S HEARING INSTRUMENTS MANUFACTURERS PATENT  
PARTNERSHIP

Requester, Respondent, and Cross-Appellant

v.

HEAR-WEAR, TECHNOLOGIES L.L.C.  
Patent Owner, Appellant, and Respondent

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Appeal 2013-003959  
Reexamination Control 95/001,021  
Patent 7,110,562  
Technology Center 3900

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Before STEPHEN C. SIU, JOSIAH C. COCKS, and  
STANLEY M. WEINBERG, *Administrative Patent Judges*.

COCKS, *Administrative Patent Judge*.

DECISION ON APPEAL

**A000002**

Appeal 2013-003959  
Reexamination Control 95/001,021  
Patent 7,110,562

## I. STATEMENT OF THE CASE

### *A. Summary*

Patent Owner, Hear-Wear, Technologies, L.L.C. (“Hear-Wear”),<sup>1</sup> appeals under 35 U.S.C. §§ 134(b) and 315(a) the Examiner’s decision to reject claims 1-9, 11, 12, 15-27, 30, 31, and 38-41 of U.S. Patent No. 7,110,562 (the “’562 patent”).<sup>2</sup> Third-Party Requester, K/S Hearing Instruments Manufacturers Patent Partnership (“HIMPP”), urges that the Examiner’s decision must be affirmed.<sup>3</sup> HIMPP also cross-appeals under 35 U.S.C. §§ 134(c) and 315(b) from the Examiner’s refusal to reject claims 1-9, 11, 12, 15-27, 30, 31, and 38-41 on other grounds and the Examiner’s refusal to reject claims 13, 14, and 32-37.<sup>4</sup> Hear-Wear contends that the

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<sup>1</sup> See Patent Assignment Abstract of Title, Reel 013543 Frame 0437 which was entered into the record of this proceeding as “Title Report” on March 3, 2008.

<sup>2</sup> See Hear-Wear’s “Appeal Brief of Patent Owner Hear-Wear, L.L.C.” filed August 9, 2011 (“PO App. Br.”) and “Patent Owner Rebuttal Brief under 37 C.F.R. § 41.71” filed July 10, 2012 (“PO Reb. Br.”).

<sup>3</sup> See HIMPP’s “Third-Party Requester’s Respondent Brief” filed September 8, 2011 (“Req. Resp. Br.”)

<sup>4</sup> See HIMPP’s “Third-Party Requester’s Corrected Brief on Appeal Under 37 C.F.R. § 41.67” filed January 20, 2012 (“Req. App. Br.”) and “Third-Party Requester’s Rebuttal Brief Under 37 C.F.R. § 41.71” filed July 11, 2012 (“Req. Reb. Br.”).

Appeal 2013-003959  
Reexamination Control 95/001,021  
Patent 7,110,562

Examiner's refusals in that regard were correct.<sup>5</sup> Claims 10, 28, and 29 are not subject to reexamination.

Oral argument was held on April 12, 2013. A transcript of the hearing was made of record on May 23, 2013.

We have jurisdiction under 35 U.S.C. §§ 134 and 315.<sup>6</sup>

### *B. The Invention*

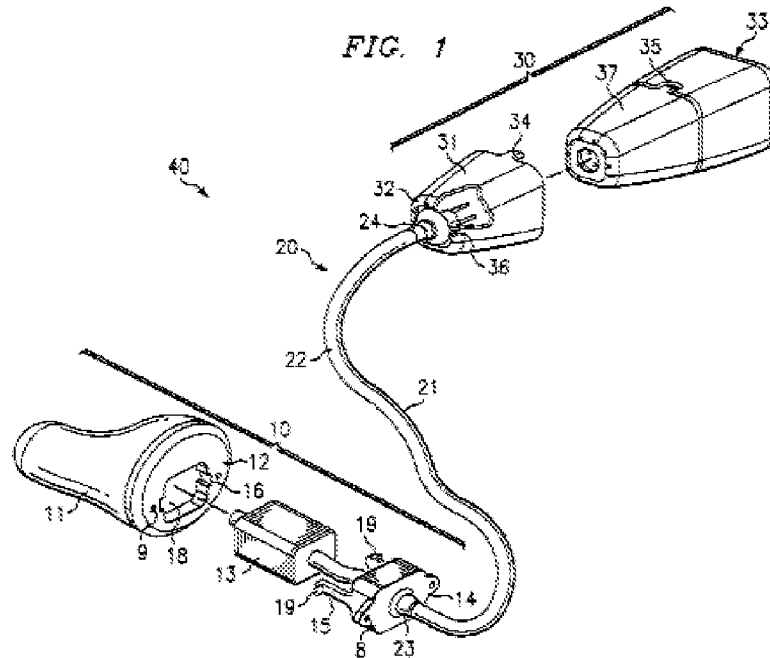
The '562 patent is directed generally to an earpiece auditory device. '562 patent, Abstract. An "exploded isometric view of an exemplary embodiment" of the invention is shown in Figure 1, which is reproduced below (*id.* at col. 4, ll. 12-14):

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<sup>5</sup> See Hear-Wear's "Patent Owner Respondent Brief Under 37 C.F.R. § 41.68" filed October 12, 2011 ("PO Resp. Br.") and "Patent Owner Second Respondent Brief Under 37 C.F.R. § 41.68" filed February 20, 2012 ("2<sup>nd</sup> PO Resp. Br.").

<sup>6</sup> In this opinion, we also refer to the Right of Appeal Notice mailed May 10, 2011 ("RAN") which was incorporated by reference in the Examiner's Answer mailed June 11, 2012.

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As depicted in Figure 1 above, earpiece auditory device 40 includes “completely-in-canal” (“CIC”) unit 10, connector 20, and “behind-the ear” (“BTE”) unit 30. *Id.* at col. 5, ll. 42-44.

Claims 1 and 22 are independent claims and are reproduced below:

1. An earpiece auditory device comprising:

a behind-the-ear (BTE) component, said BTE component being shaped to fit behind an ear of a user, wherein said BTE component comprises a module including processing circuitry;

a completely-in-canal (CIC) component, said CIC component being shaped to fit into the ear canal of the user, wherein said CIC component comprises an ear mold and a speaker, said speaker being encased in a speaker module; and

a connector physically and communicatively coupling said BTE component to said CIC component, said connector having a proximal end physically and communicatively

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coupled to said BTE component and a distal end physically and communicatively coupled to said CIC component, said connector being sufficiently rigid so as to allow said connector to be used to insert and remove said CIC component from the ear canal of the user;

wherein said speaker module is detachably physically interconnected with said ear mold, said speaker module is interconnected with said ear mold through a hollow sleeve, and said hollow sleeve is formed of resilient material.

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22. A method for providing a plurality of earpiece auditory device components, a portion of which may be assembled to form an earpiece auditory device tailored to a user, said method comprising:

providing a selected behind-the-ear (BTE) component operable to facilitate the user's intended use for the earpiece auditory device may be selected, wherein said BTE component comprises a module including processing circuitry;

providing a selected completely-in-canal (CIC) component, said selected CIC component being shaped to fit into the ear canal of the user, wherein said selected CIC component comprises an ear mold and a speaker, said speaker being encased in a speaker module; and

providing a connector of sufficient length to physically couple said selected BTE component when said selected BTE component is placed behind the ear of the user to said selected CIC component when said CIC component is placed inside the ear canal of the user, wherein said connector of sufficient length includes a proximal end physically and communicatively operable to couple to said BTE component and a distal end physically and communicatively operable to couple to said CIC component, said connector of sufficient length being

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sufficiently rigid so as to allow said connector of sufficient length to be used to insert and remove said selected CIC component;

wherein said speaker module is detachably physically interconnectable with said ear mold.

PO App. Br., Claims App'x.

### *C. The Prior Art*

#### *1. Hear-Wear's Appeal*

Schiess <i>et al.</i> ("Schiess")	US 5,265,168	Nov. 23, 1993
Reiter <i>et al.</i> ("Reiter")	US 5,606,621	Feb. 25, 1997
Posen <i>et al.</i> ("Posen")	US 5,864,628	Jan. 26, 1999
Shennib	WO 99/07182	Feb. 11, 1999

#### *2. HIMPP's Appeal*

In addition to the above-noted prior art, HIMPP relies on the following:

Toht	US 2,930,856	Mar. 29, 1960
McCarrell <i>et al.</i> ("McCarrell")	US 3,061,689	Oct. 30, 1962
Hartl <i>et al.</i> ("Hartl")	US 4,739,512	Apr. 19, 1988
Barton	US 5,046,580	Sep. 10, 1991
Ward <i>et al.</i> ("Ward")	US 5,201,007	Apr. 6, 1993
Shennib <i>et al.</i> ("Shennib '348")	US 5,701,348	Dec. 23, 1997
Taenzer <i>et al.</i> ("Taenzer")	US 6,009,183	Dec. 28, 1999
Topholm	US 2002/0138237	Sep. 26, 2002
Nonomura	JP 62-151100	July 6, 1987



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### *D. The Involved Rejections*

#### *1. Hear-Wear's Appeal*

Hear-Wear contends that the Examiner incorrectly adopted the following rejections under 35 U.S.C. § 103(a) of claims of the '562 patent<sup>7</sup>:

<b>References</b>	<b>Claims</b>
Reiter and Shennib	1-9, 11, 12, 19, 20, 22-27, 30, 31, and 41
Reiter, Shennib, and Posen	15-18 and 38-40
Reiter, Shennib, and Schiess	21

#### *2. HIMPP's Appeal*

HIMPP contends that the Examiner incorrectly declined to adopt the following rejections under 35 U.S.C. § 103(a) of claims of the '562 patent:<sup>8</sup>

<b>References</b>	<b>Claims</b>
Toht, Reiter, and Shennib	1 and 22
Nonomura and Shennib	1 and 22
Reiter, Toht, Shennib, and Ward	1 and 22
Toht, Reiter, Shennib, and "any one of Barton, Ward, McCarrell, or Taenzer" <sup>9</sup>	1 and 22
Reiter, Toht, Shennib, and "any one of Barton, McCarrell, or Taenzer" <sup>10</sup>	1 and 22

<sup>7</sup> See PO App. Br. 6-7.

<sup>8</sup> See generally Req. App. Br., p. 22.

<sup>9</sup> *Id.* at p. 25

<sup>10</sup> *Id.* at p.26

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Toht, Reiter, and Shennib <sup>11</sup>	2, 3, 9, 19, 21, 23, 24, 27, and 41
Reiter, Toht, Shennib, and Shennib '348 <sup>12</sup>	4-8, 11-14, 20, 25, 26, 30-32, and 37
Nonomura, Shennib, and Shennib '348 <sup>13</sup>	4-8, 11-14, 20, 25, 26, 30-32, and 37
Reiter, Toht, Shennib, and Shennib '348, and Topholm <sup>14</sup>	33-36
Nonomura, Shennib, Shennib '348, and Topholm <sup>15</sup>	33-36
Toht, Reiter, Shennib, Posen, and Hartl <sup>16</sup>	15-18 and 38-40
Nonomura, Shennib, Posen, and Hartl <sup>17</sup>	15-18 and 38-40

## II. ANALYSIS

### A. HEAR-WEAR'S APPEAL

Hear-Wear contests the Examiner's decision to adopt three grounds of rejection that were applied to the claims of the '562 patent involving:

(1) Reiter and Shennib; (2) Reiter, Shennib, and Posen; and (3) Reiter, Shennib, and Schiess.

#### 1. Reiter and Shennib

As proposed by HIMPP, and as adopted by the Examiner, claims 1-9, 11, 12, 19, 20, 22-27, 30, 31, and 41 stand rejected as unpatentable over

<sup>11</sup> *Id.* at p. 27.

<sup>12</sup> *Id.* at p. 28.

<sup>13</sup> *Id.*

<sup>14</sup> *Id.* at p. 30.

<sup>15</sup> *Id.*

<sup>16</sup> *Id.* at p. 31.

<sup>17</sup> *Id.*

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Reiter and Shennib. Claims 1 and 22 are independent claims. Claims 2-9, 11, 12, 19, 20, 22-27, 30, 31, and 41 ultimately depend from either claim 1 or claim 22. The patentability of the dependent claims is not argued apart from that of the independent claims with the exception of the following: (i) claims 2 and 23 and (ii) claims 4, 5, 8, and 20. We address the claims as follows: (1) claim 1; (2) claim 22; (3) claims 2 and 23; and (4) claims 4, 5, 8, and 20.

*a. Claim 1*

As discussed above, claim 1 is drawn to an earpiece auditory device that generally includes a BTE component, a CIC component, and a connector between those components. The BTE component is shaped to fit behind a user's ear and incorporates a module including processing circuitry. The CIC component is shaped to fit within a user's ear and includes an ear mold and a speaker as a part of a speaker module. The connector is "sufficiently rigid" so as to allow insertion and removal of the CIC component into and from a user's ear canal.

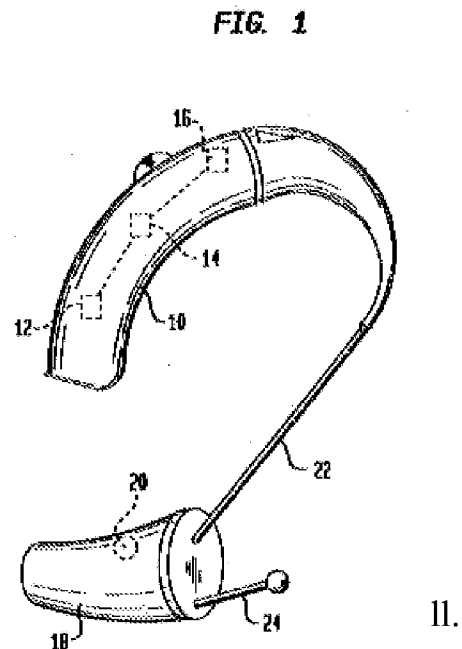
*i. The Examiner's Rejection*

Reiter is directed to a hybrid behind-the-ear and completely-in-canal hearing aid. Reiter, Title. Reiter's Abstract is reproduced below:

A hybrid BTE and CIC hearing aid has a BTE component which is worn behind the patient's ear and a CIC component which is worn in the bony portion of the patient's ear canal. The BTE and CIC components are connected together with a wire cable. Electroacoustic feedback is reduced or eliminated, allowing gain to be increased. The patient is not disturbed by the occlusion effect.

HIMPP, Reiter discloses all the limitations of claim 1 save for: (1) a connector that is “sufficiently rigid” so as to allow said connector to be used to insert and remove the CIC component from the ear canal of the user; (2) a speaker module that is detachably physically interconnected with the ear mold; and (3) the interconnection is accomplished through a “hollow sleeve” that is formed of resilient material. RAN, pp. 4-8; *see* Req. Resp. Br., pp. 7-8. To account for those features, the Examiner relies on Shennib.

Shennib discloses an “acoustic coupler” described as being “detachably secured to a receive assembly for deep insertion into an individual’s ear canal.” Shennib, Abstract. Shennib’s Figure 3 is described as “a sectioned view of the earpiece showing a receiver assembly and an acoustic coupler” and is reproduced below (*id.* at p. 6, ll. 35-36):



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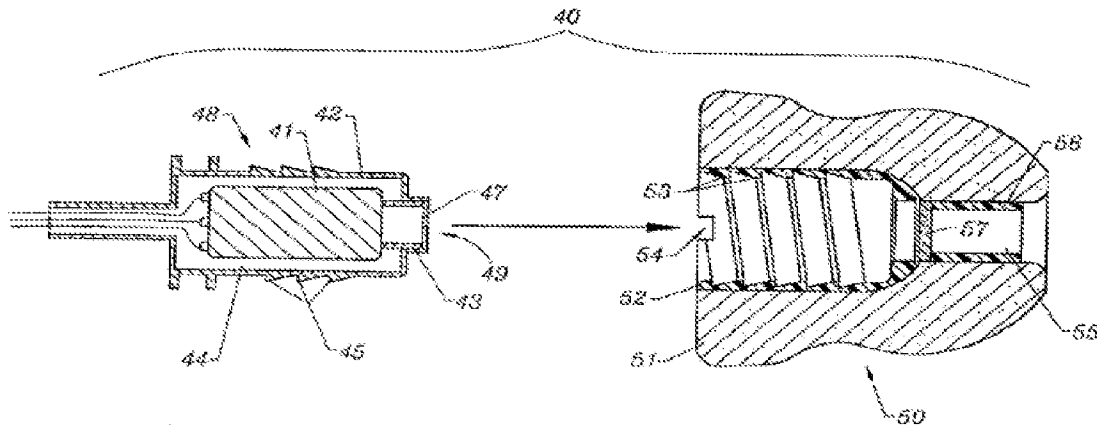


FIG. 3

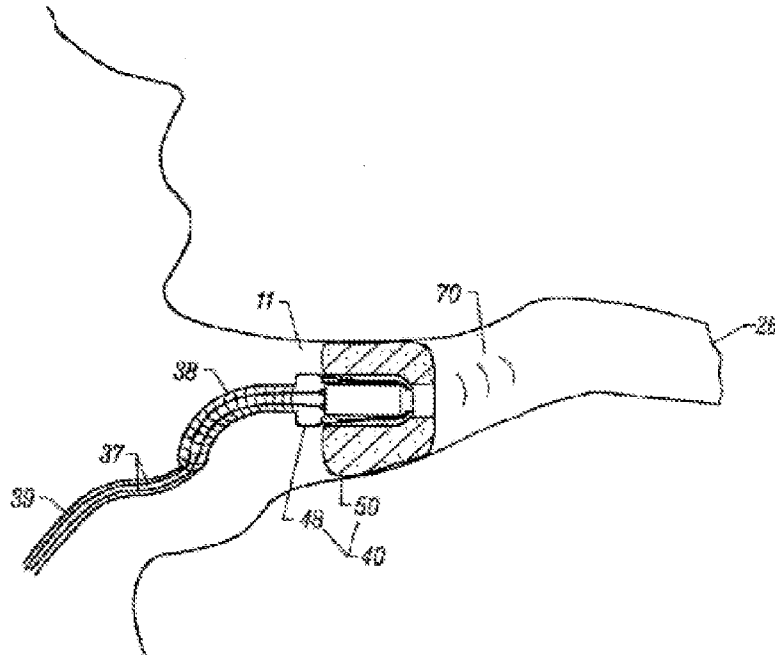
As shown in the figure above, earpiece 40 includes receiver assembly 48 and acoustic coupler 50 and may be part of “canal hearing device” 10 (not shown in figure). Shennib, p. 7, ll. 35-37. Shennib discloses the following with respect to receiver assembly 48 and acoustic coupler 50:

The receiver assembly **48** (Fig. 3) contains a receiver **41** coupled to a receiver housing **42** via a receiver housing coupler **43**. A receiver guard **47** is provided to protect the receiver from environmental and physiologic residue, including cerumen (earwax). A receiver sound port **49** provides an outlet for sound emission to a coupler sound port **55**, and subsequently to the tympanic membrane **26**. A vibration isolator **44** is provided to isolate the mechanical vibration of the receiver **41** from the receiver housing **42**, and subsequently from the hearing device **10**. Relatively rigid and tapered male threads **45** are provided for coupling the receiver housing with an acoustic coupler **50**. . . .

The acoustic coupler **50** (Fig. 3) contains a coupling sleeve **52** having coupling threads **53** and a conforming acoustic seal **51** which conforms to the shape of the ear canal when inserted therein. The coupling sleeve **52** is made of an elastically deformable, thin walled material, such as plastic.

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Shennib, p. 8, ll. 10-23. Thus, receiver assembly 48 includes receiver 41 for emitting sound, i.e., a speaker module, and is detachably physically interconnected with acoustic coupler 50, which is received in an ear canal. The acoustic coupler receives the receiver assembly and receiver via a coupling sleeve made of elastically deformable material. Shennib also discloses that its Figure 20 illustrates handle 38 that “facilitates insertion and removal the hearing device.” *Id.* at p. 8, ll. 3-5. Figure 20 is reproduced below:



**FIG. 20**

Figure 20 above depicts “a coronal view of the ear canal with an earpiece for connection to an external audio device.” Shennib, p. 7, ll. 22-23.

Based on the ground of rejection proposed by HIMPP, the Examiner determined that the above-noted disclosures of Shennib account for features

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of claim 1 absent from Reiter. In that regard, the Examiner found: (1) that Shennib's handle 38 forms part of a connector that is "sufficiently rigid" for insertion and removal of a hearing device; (2) that the configuration of Shennib's receiver assembly 48 and acoustic coupler 50 is the "physically detachably" interconnected speaker module and ear mold; and (3) that coupling sleeve 52 is the required hollow sleeve made of resilient material associated with the ear mold. *See* RAN, pp. 6-8<sup>18</sup>. In combining the teachings of Reiter and Shennib, the Examiner reasoned that Hear-Wear's claim 1 would have been obvious to one of ordinary skill in the art. *Id.*, p. 9.

Hear-Wear generally challenges the *prima facie* basis of the Examiner's rejection on theories that the combination of Reiter and Shennib does not account for the all the features of claim 1 and that it would not have been obvious to combine the teachings of Reiter and Shennib. PO App. Br., pp. 15-24. Hear-Wear also contends that it has provided sufficient evidence of "secondary considerations of nonobviousness." *Id.* at pp. 24-33.

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<sup>18</sup> We observe that throughout the RAN, the Examiner has used reference character "48" in reference to a "connector" in Shennib. Shennib's component "48" is described as a "receiver assembly" that is a distinct component from "handle 38." *See* Shennib, p. 7, l. 35-p. 8, l. 19. In identifying characteristics of Shennib's "connector," the Examiner makes explicit reference to page 8, lines 3-5 of Shennib which involves "handle 38" and not receiver assembly 48. *See, e.g.*, RAN, p. 7, ¶ 33. The Requester also advocates that the rejections at hand involving Shennib are predicated on Shennib's handle 38 as forming the claimed connector. *See, e.g.*, Req. Resp. Br., pp. 10-11. Hear-Wear states that the Examiner's interpretation of elements 38 and 48 is unclear. Hr'g Tr. 5:18-6:4. Based on the record, we conclude that Shennib's handle 38 is, at least in-part, the component regarded by the Examiner as the connector.

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For the reasons that follow, we are not persuaded of error in the Examiner's prima facie basis for rejecting claim 1 nor are we persuaded that the proffered evidence of secondary considerations outweighs the strong evidence of obviousness.

*ii. The Allegedly Absent Claim Features*

According to Hear-Wear, the Reiter and Shennib combination does not result in a "CIC" component. PO App. Br., pp. 15-17. In that regard, Hear-Wear is of the view that incorporating Shennib's handle 38 into Reiter's hearing device results in a portion that extends outside the ear canal. Hear-Wear contends that a "CIC" component "cannot protrude outside the ear canal." *Id.* As support for its position, Hear-Wear relies on the declaration testimony of Adnan Shennib<sup>19</sup> and Dr. Wayne Staab<sup>20</sup>. *Id.* at pp. 15-16. The underlying basis for Hear-Wear's position is that Shennib's handle 38 is a structure that is allegedly "unitary" or "monolithically formed" or "integrated" with speaker assembly 48 such that it is part of the speaker assembly rather than any portion of the connector between the speaker assembly and an external audio device, such as a BTE component. *See* PO App. Br., pp. 15 and 17; Supp. Shennib Decl. ¶ 11; Supp. Staab Decl. ¶ 27.

We are not persuaded by Hear-Wear. In that regard, even assuming that Hear-Wear is correct insofar as its proposed meaning of a "CIC"

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<sup>19</sup> *See* "Supplemental Declaration of Adnan Shennib" dated May 26, 2010 ("Supp. Shennib Decl."), and filed with Hear-Wear's Appeal Brief.

<sup>20</sup> *See* "Supplemental Declaration of Dr. Wayne Staab" dated May 21, 2010. ("Supp. Staab Decl."), and filed with Hear-Wear's Appeal Brief.



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component, we conclude that Shennib's handle 38 is understood reasonably as forming part of a "connector." In the context of the '562 patent, a "connector" is a component that physically couples the BTE component to the CIC component. *See* '562 patent, col. 3, ll. 40-43. Although, in some embodiments, the connector is "detachably coupled" to either the BTE or CIC components (*see, e.g., id.* at col. 3, ll. 43-45), there is nothing intrinsic to the term "connector," as it is used in the '562 patent, that requires such a detachment capability to the exclusion of a coupling configuration that is not detachable.

Claim 1 requires a connector that is "sufficiently rigid so as to allow said connector to be used to insert and remove said CIC component from the ear canal of the user." As discussed above, Shennib discloses an earpiece 40 that is part of a canal hearing device and is composed of two particular components, i.e., receiver assembly 48 and acoustic coupler 50. As illustrated in Figure 20 (reproduced *supra*), additional components are provided that are separate and distinct from earpiece 40 and allow connection of the earpiece to an external audio device. Shennib, p. 7, ll. 22-23. Those components include signal cable 39, wires 37, and handle 38 that "facilitates insertion and removal of the hearing device" and provides "strain relief" for the wires 37 within cable 39. *Id.* at p. 8, ll. 3-5. Although handle 38 may be fixed to earpiece 40 in a manner that is not viewed as detachably coupled, we do not discern that the handle is something that is properly regarded as "unitary," "monolithic," or "integrated" with the earpiece. Indeed, neither Hear-Wear nor Mr. Shennib explains adequately the underlying basis for their position to the contrary. In our view, it is evident

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from the record, including the Shennib reference's Figure 20, that handle 38 maintains a separate identity from earpiece 40 and provides a specific strain relieving function with respect to the other connecting components, i.e., wires 37 of cable 39. Thus, as articulated by HIMPP (Req. Resp. Br., p. 10), handle 38, as well as wires 37 and cable 39, is distinct from the component that is earpiece 40, such that handle and earpiece are not a single structure regarded as "unitary." To that end, we also credit the declaration testimony of Mr. Fletcher<sup>21</sup> and Dr. Thompson<sup>22</sup>, who characterize Shennib's cable 39, wires 37, and handle 38 as collectively forming a "connector" between an in-canal device and an external audio device. Fletcher Decl. ¶ 9; Thompson Decl. ¶¶ 36-38. That testimony is in accord with the plain disclosure of Shennib.

We have considered Hear-Wear's arguments, but we are not persuaded that the required "CIC" component and "connector" of claim 1 distinguish that claim from the disclosure of the prior art.

### *ii. The Obviousness Rationales*

Hear-Wear also challenges the Examiner's position that there is adequate reason to combine the teachings of Reiter and Shennib. In particular, Hear-Wear submits that there is "no rational reason" to incorporate Shennib's handle into Reiter's hearing device, in lieu of Reiter's "retrieval line," as was urged by the Examiner. PO App. Br., pp. 18-23.

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<sup>21</sup> See "Declaration of Henry H. Fletcher" dated June 28, 2010 ("Fletcher Decl."), and filed with HIMPP's Respondent Brief.

<sup>22</sup> See "Declaration of Dr. Stephen C. Thompson" dated June 28, 2010 ("Thompson Decl."), and filed with HIMPP's Respondent Brief.

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Hear-Wear also generally contends that Shennib “teaches away” from the proposed combination and that any such combination would render Shennib “unfit for its intended purpose.” *Id.* at pp. 23-24. For the reasons that follow, none of Hear-Wear’s contentions is persuasive.

*Reasons to combine*

As was noted by the Examiner, each of Reiter and Shennib recognizes that, in the hearing aid art, it is contemplated to include a component that functions to facilitate the insertion and removal of a hearing device from a patient’s ear canal. In Reiter, that component is retrieval line 24. In Shennib, it is handle 38. As set forth in the RAN, the Examiner, in effect, determined that the retrieval line and handle function for essentially the same purpose and reasoned that a skilled artisan would have appreciated that the two components may be substituted for one another. Thus, the Examiner concluded that it would have been obvious to implement Shennib’s handle 38 and its associated configuration onto Reiter’s hearing device. *See* RAN, p. 17.

Hear-Wear first challenges the Examiner’s reasoning on a theory that Reiter’s retrieval line has a more pleasing visual aesthetic than Shennib’s handle, such that a skilled artisan would not view them as equivalents of one another. PO App. Br., pp. 19-20 (citing each of the Supp. Shennib Decl. and Supp. Staab Decl.). Hear-Wear’s challenge, however, is misplaced. Even if the challenge is true, assessing whether one insertion and retrieval component may be more visually appealing such that it is preferred is not the proper inquiry when evaluating obviousness. Obviousness does not require that a teaching be better in all respects than another. Rather, the test for

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obviousness is what the combined teachings of the references would have suggested to those of ordinary skill in the art. *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991). That Reiter's retrieval line may have a more desirable aesthetic than Shennib's handle does not convey that the handle would be inoperable or unworkable if implemented in Reiter's device.

Here, the prior art establishes that there are two known mechanisms for facilitating the insertion and removal of a hearing aid. One mechanism is a separate retrieval line. Another mechanism is a rigid handle that surrounds the electric wires that connect an external device and a device arranged in a patient's ear canal. Where there are a limited number of identified solutions to solving a particular problem, a person of ordinary skill has good reason to pursue the known options within his technical grasp. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007). In this case, we agree with the Examiner that a person of ordinary skill in the art would have appreciated that each of Shennib's handle and Reiter's retrieval line is available as options that allow for handling of a hearing device. Hear-Wear's argument to the contrary does not, in our view, properly take into account the knowledge and ability of one of ordinary skill in the art.

Furthermore, we observe that Shennib also conveys that the configuration of its handle 38 has an additional benefit in providing "strain relief" to wires 37. Thus, Shennib recognizes a benefit to its handle configuration unrelated to aesthetics. Hear-Wear does not explain why obtaining that benefit would not be a factor for consideration in selecting the handle as the particular structure for inserting and removing a hearing aid device.

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Hear-Wear also speculates that “handle 38 of Shennib and retrieval line 24 of Reiter may act differently with respect to transmission of vibration.” PO App. Br., p. 20. Hear-Wear, however, does not articulate adequately the basis for that speculation. Moreover, even if the assertion is true, Hear-Wear does not explain why some difference involving vibration transmission somehow precludes combining the teachings of Reiter and Shennib.

*The “Teaching Away” Argument*

Hear-Wear’s bases its “teaching away” argument on the following disclosure in Shennib:

For cosmetic reasons, consumers demand the smallest possible devices, as evident by the dramatic increase in the use of canal devices versus larger behind-the-ear alternatives. However, even with recent advances in microminiaturization, it is not practical to include an earmold coupler to canal devices as typically used in behind-the-ear (BTE) hearing devices.

PO App. Br., p. 23 (quoting Shennib, p. 3, ll. 30-34). According to Hear-Wear, those sentences convey that Shennib’s teachings are “unsuitable” for any combination with a hearing device employing a BTE, such as Reiter, and thus constitute a “teach[ing] away.” *Id.*

A reference does not teach away if it merely expresses a general preference for an alternative invention but does not “criticize, discredit, or otherwise discourage” investigation into the applicant’s claimed invention. *DePuy Spine Inc. v. Medtronic Sofamor Danek*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed Cir. 2004)). Here, while Shennib may prefer not to associate an earmold coupler with

We are not persuaded by Hear-Wear’s assertion that Shennib “teaches away” from any combination with Reiter.

Hear-Wear also generally alleges that Reiter would be rendered “unfit for its intended purpose” if modified, based on Shennib, to include a handle assembly in lieu of a retrieval line. PO App. Br., p. 24. Hear-Wear provides little by way of explanation for its allegation other than to note that “visibility” and “aesthetic issues” have some relevance in the hearing aid art, and to state the following:

*Id.* We are not persuaded by Hear-Wear. Contrary to Hear-Wear’s above-quoted statement, Shennib’s handle 38 is already used with a hearing aid device, i.e., the hearing aid device disclosed by Shennib. Indeed, each of Reiter and Shennib is directed clearly to “hearing aids” (Reiter, col. 1, ll. 6-9; Shennib, p. 1, ll. 7-9) and each recognizes the need to include a component that facilitates insertion and removal of a portion of the hearing aid into a patient’s ear-canal. Hear-Wear does not explain meaningfully

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what “intended purpose” in Reiter would be frustrated in selecting one particular mechanism for that insertion and removal over another.

Accordingly, we are not persuaded by Hear-Wear’s argument that Reiter would somehow be rendered unfit for its intended purpose if combined with Shennib’s teachings directed to a handle component.

*Conclusion – Prima Facie case of Obviousness  
of Claim 1 Based on Reiter and Shennib*

We have considered Hear-Wear’s Appeal Brief and Rebuttal Brief. However, for the foregoing reasons, we are not persuaded of any error in the Examiner’s prima facie basis for rejecting claim 1 based on Reiter and Shennib.

Claims 3, 6, 7, 9, 11, 12, 19, and 20 ultimately depend from claim 1 and are not separately argued apart from claim 1. We also are not persuaded of error in the Examiner’s prima facie basis for rejecting those dependent claims based on Reiter and Shennib.

*b. Claim 22*

Claim 22 is independent and is drawn to a “method for providing a plurality of earpiece auditory device components, a portion of which may be assembled to form an earpiece auditory device tailored to a user.” PO App. Br., Claims App’x, p. 35. As a part of the method, claim 22 provides several components including a BTE component, a CIC component, and “a connector of sufficient length to physically couple” those two components. PO App. Br., Claims App’x, p. 36. Similar to claim 1, claim 22 requires that the connector be “sufficiently rigid” to be used to insert and remove the CIC component. *Id.*

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As with claim 1, Hear-Wear argues that the Examiner's rejection of claim 22 over Reiter and Shennib is deficient because the references allegedly do not teach a connector that is sufficiently rigid to allow insertion and removal of a CIC component. PO App. Br., p. 34. In that regard, Hear-Wear contends that Shennib's handle 38, which the Examiner relied upon in accounting for the required connector, is "not part of the connector." *Id.* Also, as it urged in connection with claim 1, Hear-Wear takes the position that Shennib "teaches away" from using a BTE component. *Id.*

For reasons that are essentially the same as those discussed above with respect to claim 1, we are not persuaded that the prior art of Reiter and Shennib fails to account for a connector that is sufficiently rigid to allow insertion and removal of a CIC component.

Hear-Wear also alleges that the combination of Reiter and Shennib does not teach the step of providing a connector that is "of sufficient length to physically couple" the BTE and CIC components once the CIC components are placed inside a user's ear canal. PO App. Br., p. 34. In particular, Hear-Wear argues that neither Shennib's speaker assembly 48 nor handle 38 is long enough to couple a BTE component to a CIC component. *Id.*

The Examiner, in rejecting claim 22, noted that each of Reiter and Shennib discloses connectors that physically couple a component placed in a user's ear canal and an external audio device. RAN, p. 13 (citing to Reiter's Figure 1) and p. 14 (citing to Shennib's Figure 20). Reiter's Figure 1 clearly illustrates a cable 22 functioning as a connector between BTE component 12 and CIC component 18. Reiter, col. 2, ll. 15-23. Shennib's Figure 20 shows



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earpiece 40 arranged in an ear canal and handle 38, wires 37, and signal cable 39 extending from earpiece 40. Although no external audio device, such as a BTE device, is shown, Shennib explains that the earpiece is connected to such an external audio device. Shennib, p. 7, ll. 22-23.

Shennib's handle 38 facilitates insertion and removal of earpiece 40 as well as providing strain relief for wires 37 within signal cable 39. Shennib, p. 8, ll. 3-5. The handle 38 is understood as rendering the connector of Shennib, which is composed of that handle, wires 37, and cable 39, sufficiently rigid to enable the insertion and removal. As with Reiter, the connector between Shennib's in-canal component and external audio component is recognized readily as being of sufficient length to connect those components. We, thus, are unpersuaded that the combination of Reiter and Shennib fails to satisfy a connector that is of sufficient length to physically couple a BTE component and a CIC component.

Lastly, Hear-Wear argues that the preamble of claim 22, in reciting "a plurality of earpiece auditory device components," where a portion of those components may be assembled to form an earpiece auditory device "tailored to a user," renders claim 22 distinct from the combination of Reiter and Shennib. PO App. Br., p. 35. We do not agree.

Even assuming that the preamble of claim 22 is "necessary to give life meaning, and vitality" to the claim so as to be construed as a limitation, *see Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999) (quoting *Kropa v. Robie*, 187 F.2d 150, 152 (CCPA 1951), we are not persuaded that the preamble distinguishes claim 22 from the teachings of the prior art. The Examiner pointed to Reiter's CIC component 18 as

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constituting a plurality of earpiece auditory device components. RAN, p. 12. We observe that CIC component 18 is not a structure viewed as being composed of only a single component. Rather, as is evident from Reiter's Figure 1, the CIC component 18 encompasses multiple structures or components, including those serving as a housing for receiver 20. The Examiner also pointed to Reiter's column 2, lines 15-16 as conveying that CIC component 18 is tailored to a user. *Id.* That portion of Reiter describes that the CIC component "has a shell which is molded to fit completely in the patient's hearing canal." Reiter, col. 2, ll. 15-16. A shell molded to fit a particular patient is understood reasonably as being tailored to a user.

Accordingly, after consideration of the record, we are not persuaded of error in the Examiner's prima facie basis for rejecting claim 22 as unpatentable over Reiter and Shennib. Claims 24-27, 30, 31, and 41 ultimately depend from claim 22 and are not separately argued. We are also not so persuaded with respect to those dependent claims.

*c. Claims 2 and 23*

Claim 2 depends from claim 1 and claim 23 depends from claim 22. Claim 2 adds to claim 1: "wherein said connector is detachably coupled at said proximal end with said BTE component." Claim 23 adds to claim 22: "wherein said selected connector is operable to detachably couple said proximal end with said BTE component."

Hear-Wear argues that neither Reiter nor Shennib discloses a BTE component that is "detachably coupled" with a connector. PO App. Br., pp. 36-37. Hear-Wear thus contends that their combination does not convey reasonably such a detachable coupling configuration.

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In accounting for that pertinent feature of claims 2 and 23, the Examiner states the following:

Shennib discloses a connector (48) that is detachably coupled at its proximal end with said behind-the-ear component because detachment of signal wire 39 from connector 48 and removal of the signal wire 39 from the interior of connector 48 would result in the connector 48 being detached from the behind-the-ear component.

RAN, pp. 10, 18. Thus, the Examiner assesses Shennib's disclosure as teaching that the attachment of signal wire 39 to the connector is one understood as "detachably coupled." The Examiner, however, does not explain the basis for that assessment nor point to evidence supporting it. That is, we do not discern how the Examiner determined that Shennib discloses that signal cable 39 is detachably coupled to any connector of Shennib.

Even assuming the Examiner's statement true, the claims require that the "connector is detachably coupled at said proximal end with said BTE component" (claim 2 and similarly in claim 23). Thus, the required detachable coupling is between the connector and the BTE component, i.e. an external audio device. Shennib's handle 38 and receiver assembly 48 are components in the vicinity of the in-canal devices of Shennib. That the signal cable 39 may be decoupled from those components does not itself suggest any detachable coupling of a connector with a BTE component, i.e., the component of the hearing aid that is external to a user's ear canal.

HIMPP does not point to any disclosure in Shennib or Reiter establishing the detachably coupling feature required by claims 2 and 23. Instead, HIMPP relies on the paragraph 15 of the declaration testimony of

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Henry H. Fletcher. *See* Req. Resp. Br., p. 22. Paragraph 15 of Mr. Fletcher's Declaration is reproduced below:

I understand that Patent Owner has argued that [Shennib] does not teach or suggest a detachable connection of the CIC connector (e.g., cable 29) to the external audio source (BTE unit). To the contrary, such a detachable connection would have immediately been seen as the most likely and logical implementation for the configuration described therein.

Fletcher Decl. ¶ 15. Thus, Mr. Fletcher concludes that the required detachable connection would be "the most likely and logical implementation" in Shennib's disclosure. Notably absent from that testimony, however, is a suitable explanation as to why such a connection would be "likely and logical" or any reference to evidence of record providing underlying support for the conclusion. Nothing requires a fact finder to credit unexplained testimony of an expert. *Rohm and Haas Co. v. Brotech Corp.*, 127 F.3d 1089, 1092 (Fed. Cir. 1997). We are not persuaded that HIMPP has accounted sufficiently for the detachable coupling required by claims 2 and 23.

Accordingly, we are unpersuaded that the teachings of Reiter taken with Shennib satisfy the requirements of claims 2 and 23. We do not sustain the Examiner's rejection of those claims based on Reiter and Shennib.

*d. Claims 4, 5, 8, and 20*

Claims 4, 5, 8, and 20 are each ultimately dependent on claim 1. Those dependent claims, reproduced below, set forth that certain components of claim 1 are "disposable":

4. The device of claim 1 where said connector is disposable.

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5. The device of claim 1 wherein said speaker module is a disposable component.

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8. The device of claim 7 wherein said ear mold and said hollow sleeve constitute a disposable component.<sup>23</sup>

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20. The device of claim 19 wherein said ear mold and said integrally encapsulated speaker module constitute a disposable component.<sup>24</sup>

PO App. Br., Claims App’x, pp. 34-35.

The Examiner determined that the “disposable” aspects of claims 4, 5, 8, and 20 are met by Shennib, reasoning that “all of the components disclosed by Shennib are ‘disposable’ within the ordinary and customary meaning of this claim terminology.” RAN, p. 10. HIMPP contends that the term “disposable” has no special definition in the ’562 patent and that under its broadest reasonable interpretation, the term means “that the user could dispose of the claimed element if desired.” Req. Resp. Br., p. 22. In support of its position, HIMPP also points to the declaration testimony of Dr. Stephen C. Thompson (*id.*), who testifies that one with ordinary skill in the art would have known that the most efficient means of addressing a malfunctioning part is to dispose of and replace the part (Thompson Decl. ¶ 45).

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<sup>23</sup> Claim 7 recites “[t]he device of claim 1 wherein said ear mold is stretched over a tubular neck of said hollow sleeve.

<sup>24</sup> Claim 19 recites “[t]he device of claim 1 wherein said speaker module is integrally encapsulated into said ear mold.”

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Hear-Wear expresses disagreement with the Examiner and HIMPP that Shennib's components are disposable. Pointing to column 21, lines 19-28 of the '562 patent, Hear-Wear urges that the term "disposable," when read in the context of that patent, means that disposable components "are readily replaced rather than repaired." PO App. Br., p. 37. Hear-Wear generally concludes that Reither and Shennib do not satisfy the disposable aspects of claims 4, 5, 8, and 20.

During reexamination, claim terms are given their broadest reasonable construction consistent with the specification. *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1259 (Fed. Cir. 2010). Claim terms are also usually given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). However, a "claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history." *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). Any such definition "must be done with reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Here, although Hear-Wear directs us to column 21, lines 19-28 of the Specification of the '562 patent (PO App. Br., p. 37), we do not discern that the portion sets forth a lexicographic definition of any claim term. Rather, the cited portion simply notes that a particular component of a disclosed embodiment is "disposable" such that it can be replaced without requiring repair, but does not set forth any special definition for the term "disposable."

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Indeed, that a component that is “disposable” may be replaced is in accord with the meaning of the term offered by HIMPP. Although Hear-Wear seemingly characterizes its position as one of disagreement with HIMPP, both parties have offered meanings of “disposable” that are essentially the same and consistent with the Specification of the ’562 patent. In that regard, “disposable,” in connection with a particular component, means that the component may be removed and replaced. That is, in our view, the ordinary and customary meaning of the term.

The Examiner and HIMPP submit that the pertinent components of Shennib are “disposable.” Although Hear-Wear does not agree with the Examiner and HIMPP, we are not persuaded that Hear-Wear’s disagreement is well founded. We do not discern that Shennib or, for that matter, Reiter imposes any restriction on the components of its hearing device that requires that any component must remain as a part of the device and cannot be removed and replaced. On this record, we do not discern how the term “disposable” as applied to the components of claims 4, 5, 8, and 20 serves to structurally distinguish those components over the corresponding components of the prior art.

We have considered the record and, for the foregoing reasons, are not persuaded of error in the Examiner’s *prima facie* basis for rejecting claims 4, 5, 8, and 20 as unpatentable over Reiter and Shennib.

## *2. Reiter, Shennib, and Posen*

The Examiner rejected claims 15-18 and 38-40 as unpatentable over Reiter, Shennib, and Posen. Claims 15-18 and 38-40 ultimately depend from either claim 1 or claim 22. Hear-Wear generally urges that the

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combination of Reiter and Shennib allegedly do not teach certain features of claims 1 and 22 and that Posen does not cure the deficiencies. As discussed above, however, we are not persuaded of any defects in the Examiner's rejection of claims 1 and 22 based on Reiter and Shennib.

Hear-Wear also offers an additional argument as to claims 17 and 18. Those claims ultimately depend from claim 1, with claim 17 adding "wherein said locking pin assembly is disposable," and claim 18 adding "where said speaker module, said ear mold, and said locking pin assembly constitute a disposable component." PO App. Br., Claim App'x.

In accounting for the requirements of claims 17 and 18, the Examiner found that components in Posen corresponding to those of claim 17 and 18 were "disposable." RAN, pp. 21- 22. Posen is directed to attenuating/damping structures for hearing aids. Posen, col. 1, ll. 8-9. Hear-Wear does not challenge the Examiner's determination that Posen discloses the features required by claims 17 and 18 other than to urge generally that those features are not "disposable." PO App. Br., p. 38.

As discussed above, the record reflects that the ordinary and customary meaning of "disposable," in conjunction with a given component, is that the component may be removed and replaced. As with Shennib and Reiter, we do not discern that Posen mandates that any component of its disclosed devices must be maintained and cannot be removed and replaced. We are not persuaded, on this record, that the Examiner was incorrect in determining that one with ordinary skill in the art would have appreciated that the pertinent components in Posen are "disposable."



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We conclude that the Examiner has established an adequate prima facie basis for rejecting claims 15-18 and 38-40 as unpatentable over Reiter, Shennib, and Posen.

### 3. *Reiter, Shennib, and Schiess*

The Examiner rejected claim 21 as unpatentable over Reiter, Shennib, and Schiess. Claim 21 depends from claim 1. Although claim 21 is addressed under a separate heading in Hear-Wear's Appeal Brief, Hear-Wear's arguments as to the patentability of claim 21 over Reiter, Shennib, and Schiess are premised on claim 21's dependency on claim 1. PO App. Br., p. 38. In that regard, Hear-Wear contends that Schiess does not cure alleged deficiencies of Reiter and Shennib in connection with the features of claim 1.

As discussed above with respect to claim 1, we are not persuaded that the combination of Reiter and Shennib fails to satisfy the features of claim 1. Accordingly, we are also not persuaded that the combination of Reiter, Shennib, and Schiess fails to establish a prima facie case of obviousness for claim 21.

### 4. *Evidence of Non-Obviousness*

"[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability. If that burden is met, the burden of coming forward with evidence or argument shifts to the applicant." *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992).

"After evidence or argument is submitted by the applicant in response, patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument." *Id.* As

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discussed above, we are persuaded that the Examiner has met her burden in presenting a prima facie case of unpatentability for each of claims 1, 3-9, 11, 12, 19, 20, 22, 24-27, 30, 31, and 41.

In response to the Examiner's rejections, Hear-Wear offers evidence of secondary considerations that it contends demonstrates the non-obviousness of claim 1. In particular, Hear-Wear contends that it has submitted ample evidence that companies in the hearing aid industry have licensed the '562 patent and that others in the industry have copied the invention of claim 1 of the '562 patent. PO App. Br., pp. 24-32. Hear-Wear urges that the proffered evidence undercuts the Examiner's case of obviousness for claim 1 of the '562 patent.

The Examiner indicates that the evidence had been considered but was insufficient to outweigh the strong evidence of obviousness presented by the prior art. RAN, pp. 25-30. HIMPP also contends that the evidence is insufficient in that regard. Req. Resp. Br., pp. 23-26.

We turn to consideration of the proffered evidence.

*a. Licensing*

Hear-Wear contends that it has submitted evidence that companies in the hearing-aid industry constituting "approximately 60% of the market share" have licensed the '562 patent. PO App. Br., p. 25. In support thereof, Hear-Wear points to a paragraph 15 of the Declaration of James Feeley<sup>25</sup>. *Id.* That paragraph of the Feeley Declaration is reproduced below:

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<sup>25</sup> See "Declaration of James Feeley" dated May 12, 2009 ("Feeley Decl.") and filed with Hear-Wear's Appeal Brief as "Item 5."

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Hear-Wear Technologies has granted licenses to a group of patents, which includes the '562 patent, to a number of companies in the hearing aid industry, including three of the five largest hearing aid manufacturers. I estimate that, collectively, the licensed companies represent approximately 60% of the total hearing aid market in the United States. Additionally, Hear-Wear is currently in negotiations to grant further licenses to other companies for the '562 patent.

Feely Decl. ¶ 15. Thus, Mr. Feeley testifies that Hear-Wear has granted licenses to a “group of patents” that includes the '562 patent. Notably absent from Mr. Feeley’s testimony, however, is credible evidence that, of that “group” of patents, it is the invention of the '562 patent that had attained industry respect. *See In re Roufett*, 149 F.1350, 1355 (Fed. Cir. 1998) (characterizing “licenses showing industry respect for the invention” as a form of objective evidence of nonobviousness). Indeed, Mr. Feely’s testimony does not attribute any particular respect or significance to the invention of the '562 patent. Furthermore, the noted testimony also does not establish that any licensed company actually practices the invention of the '562 patent as a part of any licensing agreement.

We observe that Hear-Wear attempts to bolster the above-noted testimony. In that regard, Hear-Wear points to paragraph fourteen of a supplemental Declaration of Mr. Feeley<sup>26</sup>. PO App. Br., p. 26. That paragraph is reproduced below:

Hear-Wear Technologies has granted licenses to a group of patents, which includes the '562 patent, to a number of

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<sup>26</sup> See “Supplemental Declaration of James Feeley” dated May 24, 2010 (“Supp. Feeley Decl.”) and filed with Hear-Wear’s Appeal Brief as “Item 6” of the Evidence Appendix.

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companies in the hearing aid industry, including three of the five largest hearing aid manufacturers. I estimate that, collectively, the licensed companies represent approximately 60% of the total hearing aid market in the United States. Many of the licensed manufacturers incorporate multiple teachings of the present application and its claims in their previous and current products. Additionally, Hear-Wear is currently in negotiations to grant further licenses to other companies for the '562 patent.

Supp. Feely Decl. ¶ 14. Thus, Mr. Feeley generally testifies that “[m]any of the licensed manufacturers incorporate [in their products] multiple teachings of the present application and its claims.” *Id.* According to Hear-Wear, Mr. Feeley’s testimony “supports a conclusion that the ’562 patent was important to the licensing negotiations” and is “strong evidence that the patent is nonobvious.” PO app. Br., p. 26.

“For objective evidence to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention.” *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed.Cir.1995). In that regard, while licenses may constitute evidence of nonobviousness “only little weight can be attributed to such evidence if the patentee does not demonstrate ‘a nexus between the merits of the invention and the licenses of record.’” *Id.* (quoting *Stratolex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1539 (Fed. Cir. 1983)).

Here, we do not discern that a general statement that some unspecified “teachings” of the claims of the ’562 patent were associated in some fashion with the noted licensing agreements establishes the requisite nexus. An ambiguous reference alluding only generally to such teachings provides little

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elaboration as to what teachings were of any significance. Moreover, even assuming that Mr. Feeley's testimony provides evidence that some aspects of the claims of the '562 patent are incorporated in products of the licensed companies, we are not persuaded that the evidence is "strong" or that it outweighs the palpable evidence of obviousness discussed above.

*b. Copying*

Hear-Wear also contends that it has provided evidence of copying "in the form of declarations, marketing materials, and claim charts which show that major manufacturers (*e.g.* Inerton, Oticon, and Phonak) in the hearing aid industry copied the claimed invention of the '562 patent." PO App. Br., p. 26. HIMPP disagrees with Hear-Wear that the proffered evidence demonstrates copying. Req. Resp. Br., pp. 25-26. We have considered the evidence of record and agree with HIMPP.

"[C]opying by a competitor may be a relevant consideration in the secondary factor analysis." *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (citing *Vandenberg v. Dairy Equip. Co.*, 740 F.2d 1560, 1567 (Fed.Cir.1984)). Copying as objective evidence of nonobviousness requires evidence of effort to replicate a specific product. *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010); *Iron Grip*, 392 F.3d at 1325. Furthermore, "a nexus between the copying and the novel aspects of the claimed invention must exist for evidence of copying to be given significant weight in an obviousness analysis." *Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1364 (Fed. Cir. 2012) (internal quotation omitted). Generally, evidence of alleged copying may be given little weight when the copy is not identical to the product embodying the

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claimed invention. *See Pentec, Inc. v. Graphic Controls, Corp.*, 776 F.2d 309, 317 (Fed. Cir. 1985).

Here, Hear-Wear points to evidence that it contends establishes that products from three companies, Interton, Oticon, and Phonak, are copies of a “Voice-Q PAC hearing aid” which embodies the claimed invention of the ’562 patent. PO App. Br., p. 26. The evidence offered by Hear-Wear includes marketing materials for products from each of Interton, Oticon, and Phonak and “claim charts” that Hear-Wear contends are sufficient to demonstrate copying of the invention of claim 1.<sup>27</sup> In particular, the products are described as a “GN/Interton Shape Product,” an “Oticon Delta Product,” an “Oticon Epoq Product,” and a “Phonak Micropower Product.” PO App. Br, Evidence App’x, items 8, 10, 11, and 12.

In reviewing the noted claim charts, we observe that with respect to the “GN/Interton Shape Product,” the “Oticon Delta Product,” and the “Oticon Epoq Product,” the charts do not explain how the “sufficiently rigid connector” requirement of claim 1 is set forth in the pertinent product. *See id.* at items 1, 10, and 11. Indeed, the claim charts make no reference to that feature in connection with the referenced products. It also is not readily apparent how that feature is disclosed or described in the accompanying marketing materials of the products.

With respect to the “Phonak Micropower Product,” the claim chart generally states that a corresponding connector portion is sufficiently rigid for insertion and removal and draws support for that statement through a

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<sup>27</sup> The marketing materials appear as items 8-12 in the Evidence Appendix of Hear-Wear’s Appeal Brief.

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representation that the “Patent Owner’s inspection” of the product demonstrates that it is sufficiently rigid. PO App. Br., Evidence App’x, item 12. We do not discern that the noted representation is offered as declaration testimony that is compliant with 37 C.F.R. § 1.68. The Patent Owner’s blanket assurance that the connector is sufficiently rigid as required amounts simply to an inadequately supported assertion. It also is not apparent readily how that requirement is set forth in the accompanying marketing materials of the Phonak Micropower product.

We have considered the evidence presented but do not discern that it adequately establishes that the pertinent products are replications of a product that includes all the features of claim 1 of the ’562 patent. In any event, even assuming that the noted “GN/Interton,” “Oticon,” and “Phonak” products do incorporate all the features of claim 1, it is not the case that “every competing product that arguably falls within the scope of a patent is evidence of copying.” *IronGrip Barbell Co., Inc.*, 392 F.3d at 1325. Rather, as noted above, copying requires the “replication” of a specific product was replicated. *Id.*

Here, Hear-Wear bases its “copying” position on the introduction of its “Voice-Q PAC” hearing aid at a convention in 2003, which Hear-Wear contends is a hearing aid embodying the invention of the ’562 patent. PO App. Br., pp. 26-27. According to Hear-Wear, its proffered evidence shows that representatives of each of Interton, Oticon, and Phonak were at that conference and “used their knowledge of the invention of the ’562 [p]atent to develop” to copy hearing aids between 2005 and 2006. *Id.* at p. 27.

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Even assuming that the evidence adequately establishes that representatives of those companies were in attendance at the conference, Hear-Wear offers little in the way of support for its assertion that it was the knowledge of the “Voice-Q PAC” product presented at the 2003 convention that was “used” to produce the noted competing products. As discussed above, all of the components of claim 1 of the ‘562 patent were already known in the hearing aid prior art and used for the same purposes as in the ‘562 patent. That Interon, Oticon, and Phonak were represented at the conference and also developed products incorporating those prior art components does not itself show, as Hear-Wear specifically urges, that it was the knowledge of the “Voice-Q PAC” hearing-aid that was used. However, the underlying basis of Hear-Wear’s assertions of copying is that it was the knowledge gleaned specifically from the conference that led to the alleged copying.

*c. Conclusion – Evidence of Non-Obviousness*

We have carefully considered the evidence offered by Hear-Wear in support of its position that claim 1 of the ‘562 patent is non-obvious. We have weighed that evidence with the evidence offered by HIMPP and the Examiner in support of obviousness. On balance, we conclude that the strong evidence of obviousness outweighs the weak evidence of non-obviousness.

*5. Summary – Hear-Wear’s Appeal*

For the foregoing reasons, we summarize our determination as follows:



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The Examiner's rejection of claims 1, 3-9, 11, 12, 19, 20, 22, 24-27, 30, and 41 based on Reiter and Shennib is sustained.

The Examiner's rejection of claims 15-18 and 38-40 over Reiter, Shennib, and Posen is sustained.

The Examiner's rejection of claim 21 over Reiter, Shennib, and Schiess is sustained.

The Examiner's rejection of claims 2 and 23 over Reiter and Shennib is not sustained.

#### *B. HIMPP'S APPEAL*

HIMPP appeals the Examiner's decision confirming the patentability of claims 13, 14, and 32-37 of the '562 patent. HIMPP also contends that the Examiner erred in declining to maintain various proposed rejections involving each of claims 1-9, 11-27, and 30-41 (the "proposed rejections").

##### *1. The Confirmation of Claims 13, 14, and 32-37*

Claim 13 depends from claim 1 and adds that "said ear mold is a custom fit ear mold." Claim 32 depends from claim 22 and adds the same feature. Claim 14 depends from claim 13 and claims 33-37 ultimately depend from claim 32. The Examiner's refusal to reject the above-noted claims is based on the added features of each of claims 13 and 32. In particular, the Examiner offered the following reasoning:

Claims 13 and 32 require an ear mold that is a custom fit ear mold. Shennib teaches away from the use of a custom fit ear mold stating on page 3 in the second and third full paragraphs:

Unfortunately, even with custom earpieces or canal devices, small gaps between the ear piece and the wall of the ear canal frequently occur.

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These gaps, which are a significant source of acoustic feedback, occur because ear impressions are unable to mimic the geometry of the ear canal identically. Furthermore, gaps can also occur during canal deformations associated with jaw movements.

Proving a tight fit to minimize gaps and improve sealing is usually accompanied by discomfort, irritation, or even pain particularly in the bony portion of the canal which is sensitive and more prone to discomfort and irritation.

Accordingly, modifying the completely-in-canal component disclosed by Shennib to use a custom fit ear mold would not have been obvious to one of ordinary skill in the art at the time of the invention. Claims 14 and 33-37 depend from claims 13 and 32, respectively and likewise are confirmed.<sup>28</sup>

Thus, the basis of the Examiner's non-adoption of any proposed rejection of claims 13, 14, and 32-37 is premised on a theory that Shennib "teaches away" from a custom fit ear mold. That is a position also advocated by Hear-Wear (2<sup>nd</sup> PO Resp. Br., pp. 6-7) but disputed by HIMPP (Req. App. Br., pp. 10-12).

We are not persuaded that the Examiner's teaching away position is correct. A reference "teaches away" when it criticizes, discredits or otherwise discourages investigation into the claimed invention. *DePuy Spine Inc.*, 567 F.3d at 1327. Here, however, rather than criticizing, discrediting or discouraging the use of "custom" earmolds, the reproduced portion of Shennib simply notes that "even" with such custom earpieces,

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<sup>28</sup> See page 34 of the "Office Action In Inter Partes Reexamination" mailed March 31, 2010.

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undesirable gaps may be present between the earpiece and the wall of an ear canal. That such gaps “even” occur with such custom pieces does not convey that such custom ear pieces are undesirable as compared with non-custom ear pieces. Indeed, the logical reading of that disclosure merits the opposite conclusion. That is, such gaps are known to arise when using non-custom ear pieces, such as ear molds, and that, while using custom ear molds may reduce the size of such gaps, they still remain as a detrimental factor or undesired result.

Furthermore, even assuming that Shennib recognizes some drawbacks in connection with “custom” ear molds, the reference also sets forth that custom fabrication of ear pieces is a known approach “to ensure an exact fit of the earpiece to the canal of the individual” and that providing a “tighter fit” is intended “to minimize gaps and improve sealing[.]” Shennib, p. 3. While such a tighter fit may be “accompanied by discomfort, irritation, or even pain” (*id.*), it is clear that there is a trade-off between such detriments and the gap minimization and sealing improvement benefits noted-above. That Shennib may express generally a preference for a technique that minimizes the possibility of discomfort does not mean that it teaches away from investigation into other techniques. *See DePuy Spine Inc.*, 567 F.3d at 1327.

We also observe that HIMPP relies on the declaration testimony of Henry Fletcher<sup>29</sup> in urging that customized ear molds were known in the art. Req. App. Br., p. 11. Mr. Fletcher testifies that based on the disclosure of

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<sup>29</sup> See “Declaration of Henry H. Fletcher” dated June 28, 2010 (“Fletcher Decl.”) and filed as “Item 1” in the Evidence Appendix of HIMPP’s Appeal Brief.

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Shennib, one with ordinary skill in the art would have known that “customized ear molds are a known fitting option” despite the recognized drawbacks and that “[f]or some, custom ear molds would have been seen as a viable option and perhaps even the preferred option.” Fletcher Decl. ¶ 16. We credit that testimony, as it is, in our view, consistent and complementary with the disclosure of Shennib.

For the foregoing reasons, we disagree with the Examiner and Hear-Wear that Shennib “teaches away” from the use of custom ear molds. We are thus not persuaded the teachings of Shennib are precluded from combination with Reiter in connection with custom fit ear molds.

## *2. The Proposed Rejections*

HIMPP contends that the Examiner erred in declining to adopt various proposed claims rejections. By our count, there are ten such rejections that were proposed by HIMPP in its request for *inter partes* reexamination of the ’562 patent in connection with claims 1-9, 11-27, and 30-41.

### *a. Claims 13, 14, and 32-37*

With respect to claims 13, 14, and 32-37, we observe that HIMPP urges the following with respect to the relief that it seeks from this Board in connection with the rejections that were not adopted by the Examiner:

In view of the foregoing, Requester requests that the Board reverse the confirmation of claims 13, 14, and 32-37, by overturning the Office’s erroneous finding that Shennib teaches away from a custom ear mold.

Req. App. Br., p. 32. Thus, the relief that HIMPP seeks with respect to claims 13, 14, and 32-37 is that this Board “reverse” the Examiner’s

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confirmation of claims 13, 14, and 32-37 as patentable and, in so reversing, presumably enter a corresponding ground of rejection of those claims that was outlined in HIMPP's request for *inter partes* reexamination as a new ground of rejection.

HIMPP proposed a ground of rejection of claims 13, 14, 32 and 37 involving the teachings of Reiter, Toht, Shennib, and Shennib '348 and a ground of rejection of claims 33-36 involving Reiter, Toht, Shennib, and Shennib '348, and Topholm. As discussed above, we are not persuaded that Shennib teaches away from a custom ear mold.

We have considered Hear-Wear's arguments offered in its Second Respondent Brief that a combination involving Reiter, Toht, and Shennib is insufficient to account for certain aspects of the claims. *See generally* 2<sup>nd</sup> PO Resp. Br., pp. 7-11 and 22-23. We are not persuaded by any of those arguments. For example, particularly in light of the teachings of Shennib, we are satisfied that a connector that is "sufficiently rigid" to allow insertion and removal of a CIC component from a user's ear canal is known in the art. We are also persuaded that a person of ordinary skill in the art would have had adequate reasons to combine the teachings of Reither, Toht, and Shennib.

We are persuaded that HIMPP's request for *inter partes* reexamination establishes that claims 13, 14, and 32-37 would have been obvious in light of the prior art. Accordingly, we enter the following rejections that were proposed by HIMPP:

- A. Claims 13, 14, 32, and 37 are unpatentable under 35 U.S.C. § 103(a) based on Reiter, Toht, Shennib, and Shennib '348; and

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B. Claims 33-36 are unpatentable under 35 U.S.C. § 103(a) Reiter, Toht, Shennib, and Shennib '348, and Topholm.

The above-noted grounds of rejection constitute new grounds under 37 C.F.R. § 41.77(b) and are hereby designated as such.

*b. Claims 1-9, 11, 12, 15-27, 30, 31, and 38-41*

We observe that with respect to the remaining rejections that are at issue in HIMPP's appeal and applied to claims 1-9, 11, 12, 15-27, 30, 31, and 38-41, HIMPP requests the following relief from the Board:

Requester submits that if the rejections adopted in the Third Office Action should be reversed as to any claim or claims, that claim or claims are still unpatentable over the combination of references proposed in the twice-adopted and arbitrarily withdrawn proposed [rejections]. Thus, in the event that any of these rejections are reversed, Requester respectfully requests that the Board set forth the corresponding unadopted proposed rejection as a new ground of rejection under 37 CFR 41.77(b)

Req. App. Br., p. 32. Thus, the relief that HIMPP seeks is that, "in the event" this Board reverses any claim rejection adopted by the Examiner in the "Third Office Action"<sup>30</sup>, the Board should enter a corresponding unadopted ground of rejection set forth in HIMPP's request as a new ground of rejection. Thus, HIMPP's requested relief is contingent on the Board's reversal of any claim rejection that was adopted by the Examiner.

As discussed above in the context of Hear-Wear's appeal, the Board has sustained all the rejections that were adopted by the Examiner save for the rejection of claims 2 and 23 based on the combination of Reiter and

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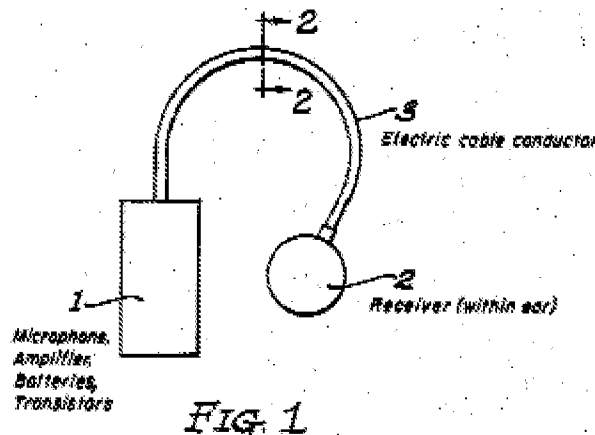
<sup>30</sup> We understand that the "Third Office Action" is the Office action mailed March 31, 2010.

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Shennib. HIMPP alternatively proposes that claims 2 and 23 are unpatentable over a combination of Toht, Reiter, and Shennib.

Dependent claims 2 and 23 add to claims 1 and 22, respectively, that the connector is “detachably coupled” (claim 2) or “operable to detachably couple” (claim 23) to the proximal end of a BTE component. As noted above, we determined that a combination of Reither and Shennib does not account for that detachable coupling feature. HIMPP’s alternative ground of rejection of claims 2 and 23 relies on Toht for that feature.

Toht is directed to a hearing aid. Toht’s Figure 1 discloses an embodiment of the invention and is reproduced below:



As shown in Figure 1, amplifier unit 1 is attached, via cable conductor 3, to receiver portion 2 that is placed within a user’s ear. Amplifier unit 1 is described as a component that may be worn “behind a person’s ear.” Toht, col. 1, ll. 45-49. Toht also discloses that cable or “connector” 3 is “normally detachably connected to units 1 and 2, as by plug and socket connection.” *Id.* at col. 1, ll. 61-63. In light of Toht’s disclosure, we are satisfied that a person of ordinary skill in the art would have known that hearing aids, including known components such as a CIC component and a BTE

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component, may be connected via a connector portion that is detachably coupled to the BTE, as well as the CIC component, so as to allow detachment of the connector from each component when desired.

Accordingly, we are persuaded that claims 2 and 23 would have been obvious in light of the ground of rejection based on the combination of Toht, Reiter, and Shennib, which was proposed by HIMPP. Accordingly, we enter a ground of rejection of claims 2 and 23 as unpatentable under 35 U.S.C. § 103(a) based on Toht, Reiter, and Shennib. That ground of rejection constitutes a new ground under 37 C.F.R. § 41.77(b) and is hereby designated as such.

### III. CONCLUSION

For the foregoing reasons, we conclude that the record adequately establishes that each of claims 1-9, 11-27, and 30-41 of the '562 patent is unpatentable over the prior art.

### IV. ORDER

#### *1. Hear-Wear's Appeal*

The Examiner's decision to reject claims 1, 3-9, 11, 12, 19, 20, 22, 24-27, 30, 31, and 41 based on Reiter and Shennib is affirmed.

The Examiner's decision to reject claims 15-18 and 38-40 over Reiter, Shennib, and Posen is affirmed.

The Examiner's decision to reject claim 21 over Reiter, Shennib, and Schiess is affirmed.

The Examiner's decision to reject claims 2 and 23 over Reiter and Shennib is reversed.



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*2. HIMPP's Appeal*

We enter the following new grounds of rejection:

- A. Claims 13, 14, 32, and 37 are unpatentable under 35 U.S.C. § 103(a) based on Reiter, Toht, Shennib, and Shennib '348;
- B. Claims 33-36 are unpatentable under 35 U.S.C. § 103(a) based on Reiter, Toht, Shennib, Shennib '348, and Topholm; and
- C. Claims 2 and 23 are unpatentable under 35 U.S.C. § 103(a) based on Toht, Reither, and Shennib.

We do not reach the merits of any other grounds of rejection discussed as a part of HIMPP's appeal.

This decision contains new grounds of rejection pursuant to 37 C.F.R. § 41.77(b) which provides that “[a]ny decision which includes a new ground of rejection pursuant to this paragraph shall not be considered final for judicial review.” Correspondingly, no portion of the decision is final for purposes of judicial review. A requester may also request rehearing under 37 C.F.R. § 41.79, if appropriate; however, the Board may elect to defer issuing any decision on such request for rehearing until such time that a final decision on appeal has been issued by the Board.

For further guidance on new grounds of rejection, see 37 C.F.R. § 41.77(b)-(g). The decision may become final after it has returned to the Board. 37 C.F.R. § 41.77(f).

37 C.F.R. § 41.77(b) also provides that the Patent Owner, WITHIN ONE MONTH FROM THE DATE OF THE DECISION, must exercise one

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of the following two options with respect to the new grounds of rejection to avoid termination of the appeal as to the rejected claims:

(1) *Reopen prosecution.* The owner may file a response requesting reopening of prosecution before the examiner. Such a response must be either an amendment of the claims so rejected or new evidence relating to the claims so rejected, or both.

(2) *Request rehearing.* The owner may request that the proceeding be reheard under § 41.79 by the Board upon the same record. . . .

Any request to reopen prosecution before the examiner under 37 C.F.R. § 41.77(b)(1) shall be limited in scope to the “claims so rejected.” Accordingly, a request to reopen prosecution is limited to issues raised by the new ground(s) of rejection entered by the Board. A request to reopen prosecution that includes issues other than those raised by the new ground(s) is unlikely to be granted. Furthermore, should the patent owner seek to substitute claims, there is a presumption that only one substitute claim would be needed to replace a cancelled claim.

A requester may file comments in reply to a patent owner response. 37 C.F.R. § 41.77(c). Requester comments under 37 C.F.R. § 41.77(c) shall be limited in scope to the issues raised by the Board's opinion reflecting its decision to reject the claims and the patent owner's response under paragraph 37 C.F.R. § 41.77(b)(1). A newly proposed rejection is not permitted as a matter of right. A newly proposed rejection may be appropriate if it is presented to address an amendment and/or new evidence properly submitted by the patent owner and is presented with a brief

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explanation as to why the newly proposed rejection is now necessary and why it could not have been presented earlier.

Compliance with the page limits pursuant to 37 C.F.R. § 1.943(b), for all patent owner responses and requester comments, is required.

The examiner, after the Board's entry of a patent owner response and requester comments, will issue a determination under 37 C.F.R. § 41.77(d) as to whether the Board's rejection is maintained or has been overcome. The proceeding will then be returned to the Board together with any comments and reply submitted by the owner and/or requester under 37 C.F.R. § 41.77(e) for reconsideration and issuance of a new decision by the Board as provided by 37 C.F.R. § 41.77(f).

AFFIRMED-IN-PART;

37 C.F.R. § 41.77(b)

peb

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE  
PATENT TRIAL AND APPEAL BOARD

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K/S HEARING INSTRUMENTS MANUFACTURERS PATENT  
PARTNERSHIP

Requester, Respondent, and Cross-Appellant

v.

HEAR-WEAR, TECHNOLOGIES LLC  
Patent Owner, Appellant, and Respondent

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*Inter partes* Reexamination Control 95/001,021  
Patent 7,110,562  
Technology Center 3900

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Before JEFFREY B. ROBERTSON, *Administrative Patent Judge*.

ORDER

BOARD RULE 41.77(f)

This proceeding has been referred to the Board for a finalization of the Board's Decision mailed December 6, 2013 (hereinafter "Decision"). In that Decision, the Board affirmed-in-part the grounds of rejection appealed by Patent Owner.<sup>1</sup> The Board entered new grounds of rejection as to claims 2, 13, 14, 23,

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<sup>1</sup> See Decision 2-39, 46.

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and 32-37 pursuant to 37 C.F.R. § 41.77(b) in the Decision.<sup>2</sup> In response to the new grounds of rejection, the Patent Owner did not timely file either a response requesting reopening of prosecution pursuant to 37 C.F.R. § 41.77(b)(1) or a request for rehearing based upon the same record pursuant to 37 C.F.R. § 41.77(b)(2). As a consequence, the appeal proceeding as to claims 2, 13, 14, 23, and 32-37 is terminated. *See* 37 C.F.R. § 41.77(b).

The Board's Decision is now final and appealable to the United States Court of Appeals for the Federal Circuit, as the parties' rights to request rehearing are exhausted. *See* 37 C.F.R. § 41.81, which refers to 37 C.F.R. § 1.983.

#### ORDER

The decision affirming Examiner's decision to reject claims 1, 3-9, 11, 12, 15-22, 24-27, 30, 31, and 38-41 is final and appealable.

Appeal proceedings as to claims 2, 13, 14, 23, and 32-37 are terminated.

This paper serves as the new decision under 37 C.F.R. § 41.77(f); to the extent the rule calls for a decision. Any requirement beyond that of the rule is hereby waived.

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<sup>2</sup> Decision 39-47.

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US007110562B1

(12) **United States Patent**  
**Feeley et al.**(10) **Patent No.:** **US 7,110,562 B1**  
(45) **Date of Patent:** **Sep. 19, 2006**(54) **BTE/CIC AUDITORY DEVICE AND  
MODULAR CONNECTOR SYSTEM  
THEREFOR**(75) **Inventors:** **Jim Feeley, Bixby, OK (US); Mike  
Feeley, Tulsa, OK (US)**(73) **Assignee:** **Hear-Wear Technologies, LLC, Tulsa,  
OK (US)**(\*) **Notice:** Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 326 days.(21) **Appl. No.:** **10/238,829**(22) **Filed:** **Sep. 10, 2002****Related U.S. Application Data**(63) Continuation-in-part of application No. 09/927,891,  
filed on Aug. 10, 2001.(51) **Int. Cl.**  
**H04R 25/00** (2006.01)(52) **U.S. CL.** ..... **381/322; 381/328; 381/330**(58) **Field of Classification Search** ..... **381/322,**  
**381/324, 330, 328, 380, 381, 382, FOR. 133,**  
**381/FOR. 132, FOR. 135**

See application file for complete search history.

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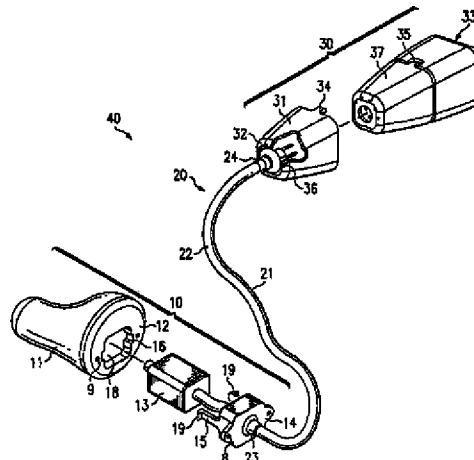
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*Primary Examiner*—Sinh Tran*Assistant Examiner*—Brian Ensey(74) *Attorney, Agent, or Firm*—Fulbright & Jaworski LLP(57) **ABSTRACT**

An earpiece auditory device includes a behind-the-ear (BTE) component, which includes processing circuitry. In an embodiment, the device also includes a completely-in-canal (CIC) component, shaped to fit into the ear canal of the user such that it touches the bony portion of the ear canal. In some embodiments, the CIC component includes either a universal fit or a custom fit ear mold. The custom fit ear mold can be fabricated using a rapid prototyping technology, in which the contours of the user's ear canal are scanned, and the scan data is used either directly or indirectly to replicate the ear canal contours of that user into the custom fit ear mold. In some embodiments, the ear mold is detachably interconnected with a speaker module, preferably using either an intermediate sleeve or a detachable locking pin assembly. In another embodiment, the speaker module is permanently encapsulated within the ear mold.

**45 Claims, 10 Drawing Sheets****A000056**

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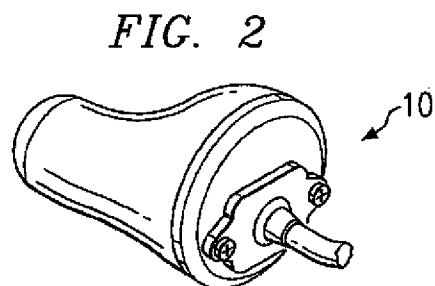
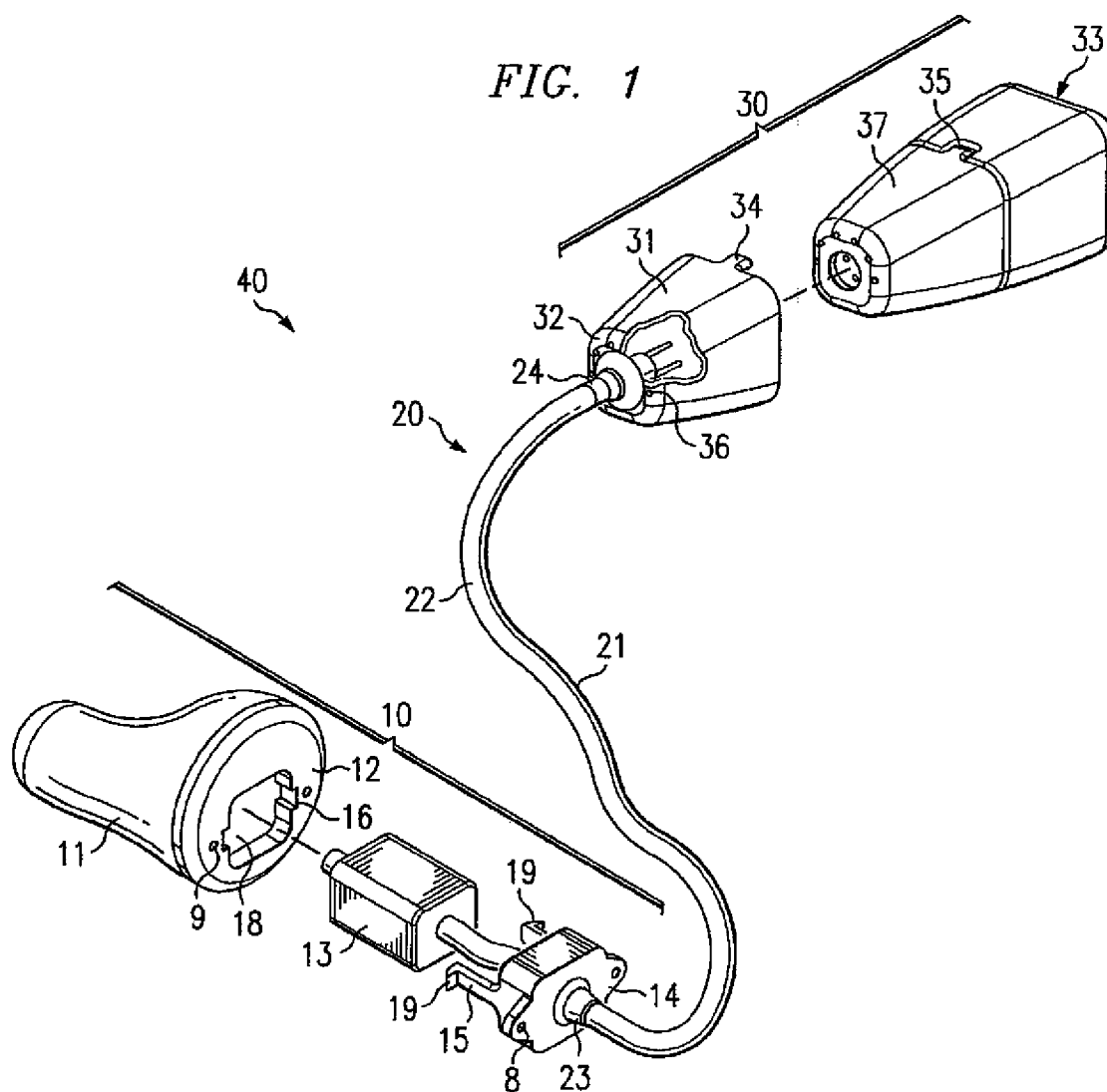
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FIG. 3

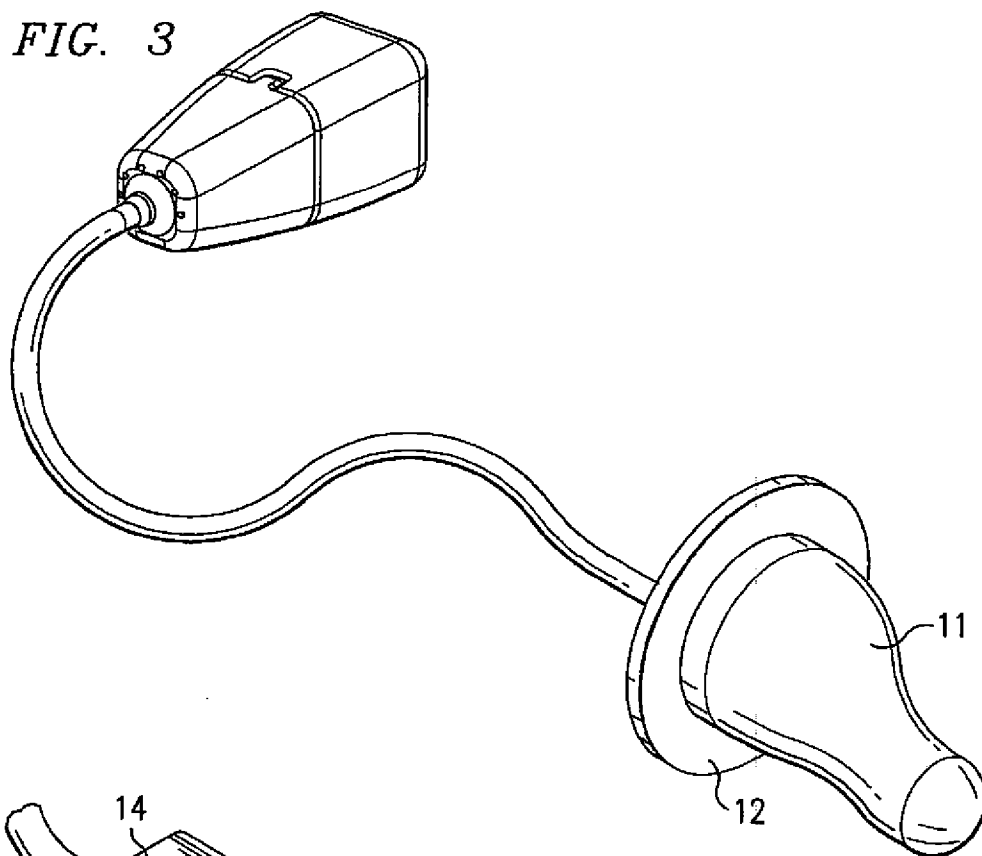


FIG. 5

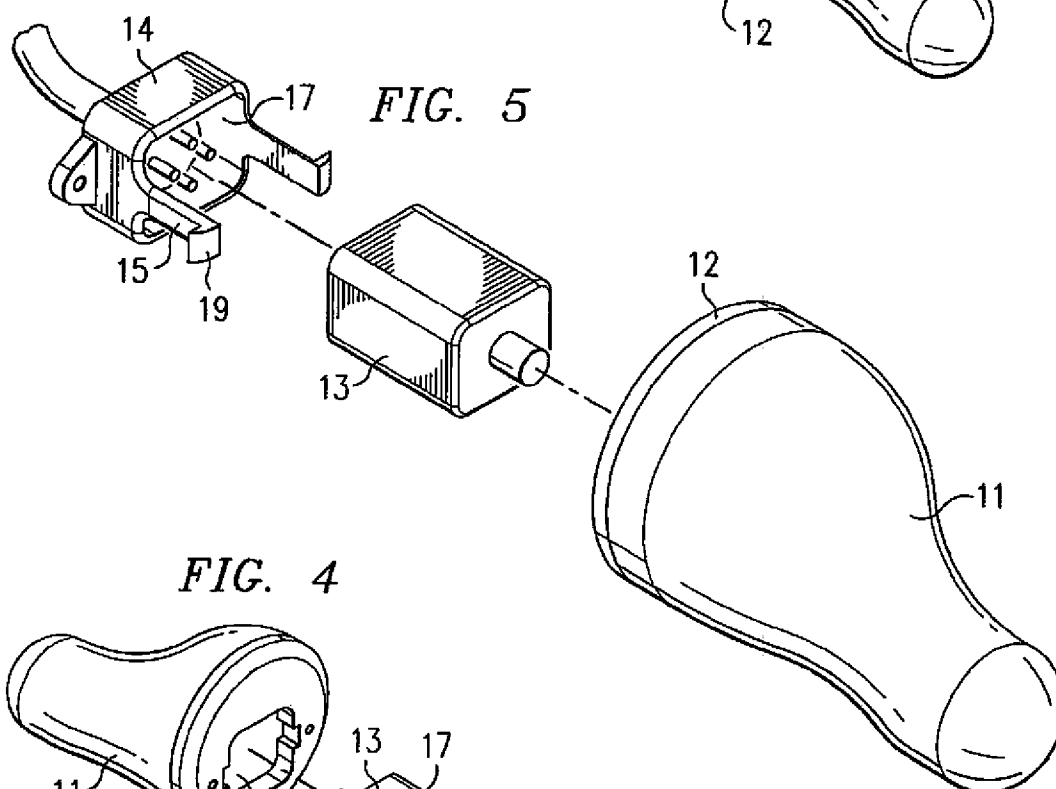
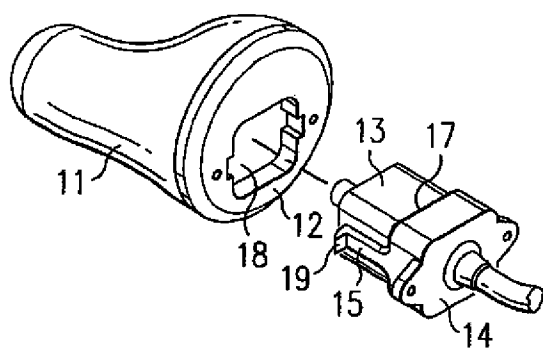


FIG. 4



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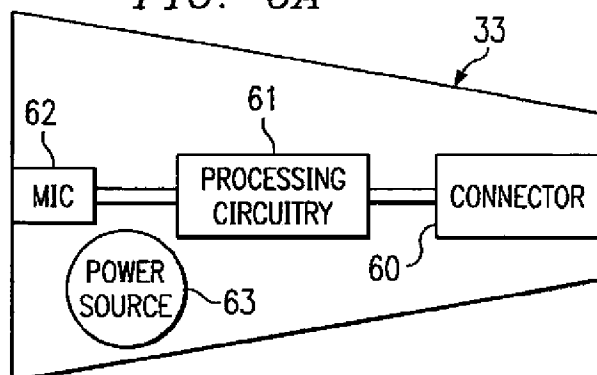
**U.S. Patent**

Sep. 19, 2006

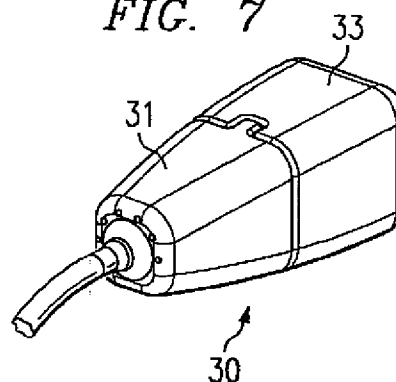
Sheet 3 of 10

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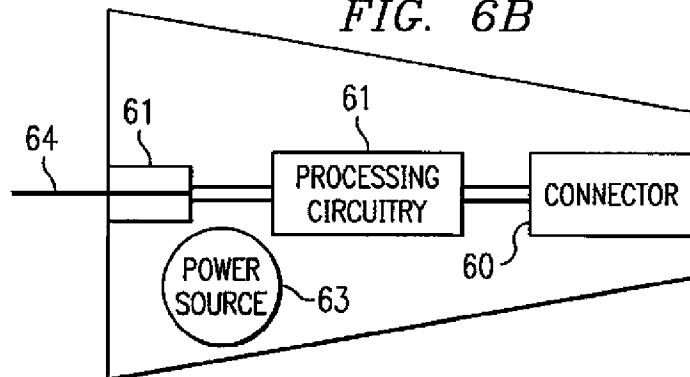
*FIG. 6A*



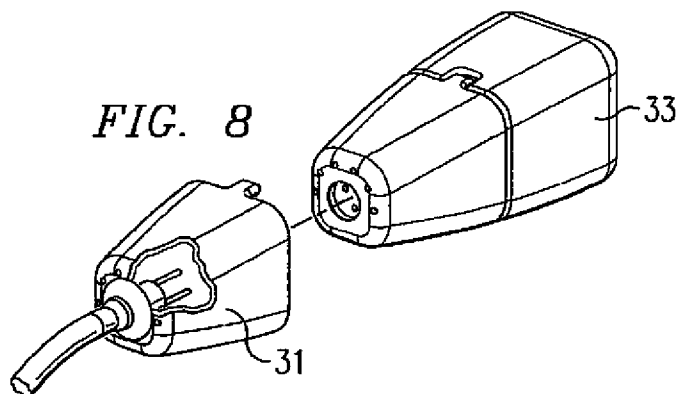
*FIG. 7*



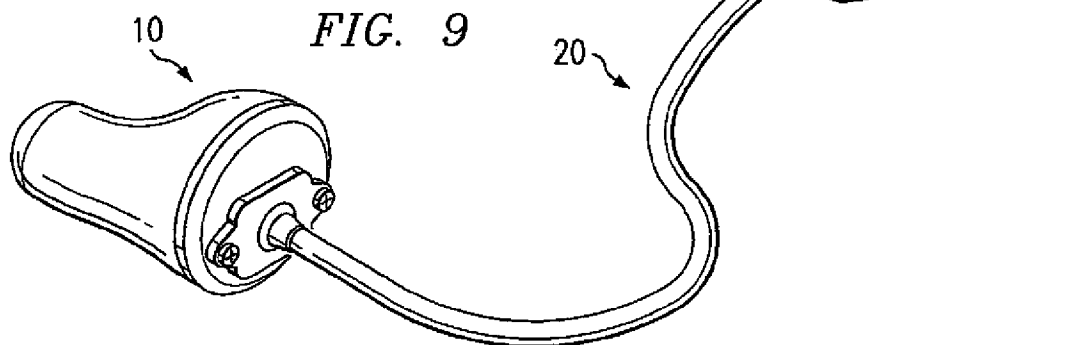
*FIG. 6B*



*FIG. 8*



*FIG. 9*



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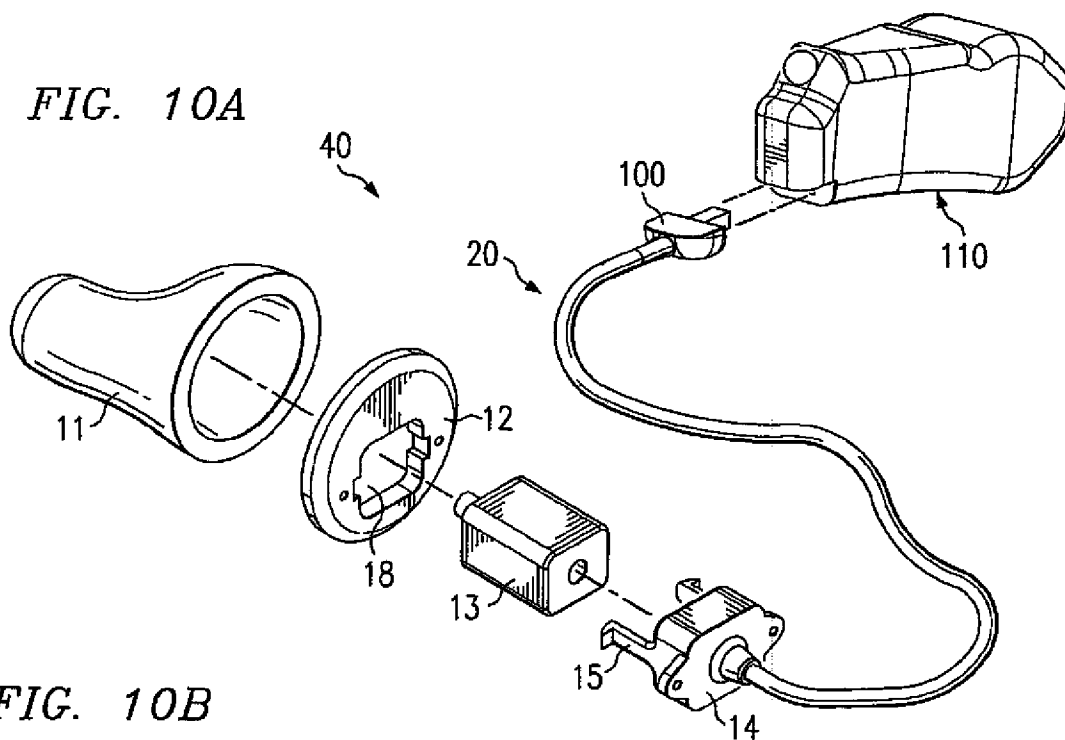
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**Sep. 19, 2006**

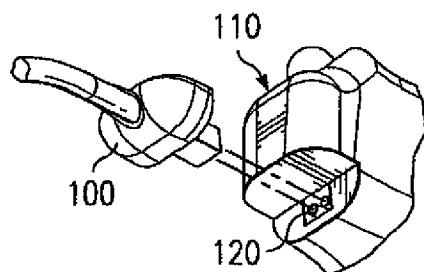
**Sheet 4 of 10**

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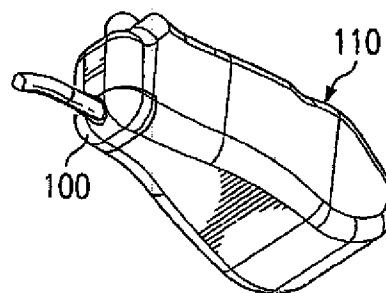
*FIG. 10A*



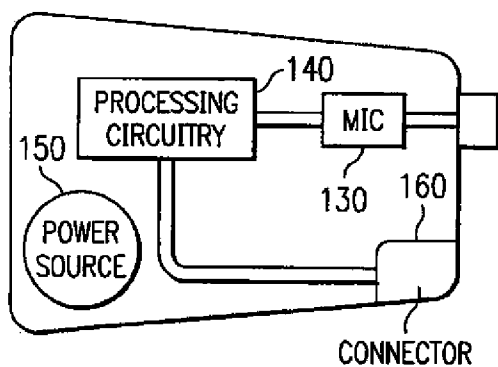
*FIG. 10B*



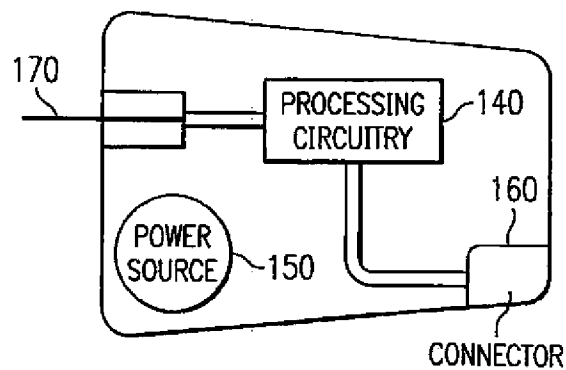
*FIG. 10C*



*FIG. 11A*



*FIG. 11B*



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FIG. 12A

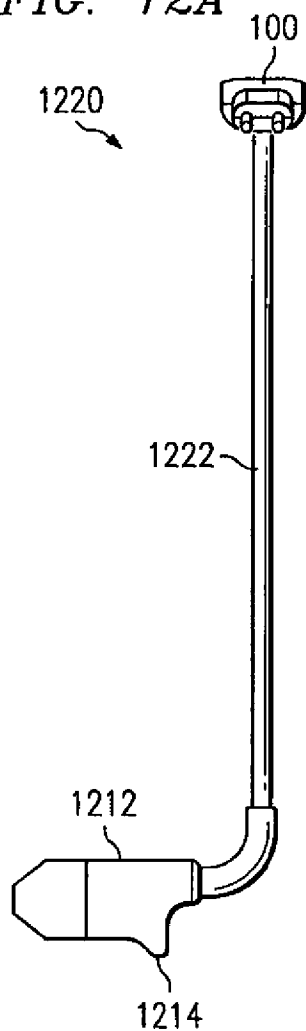


FIG. 12B

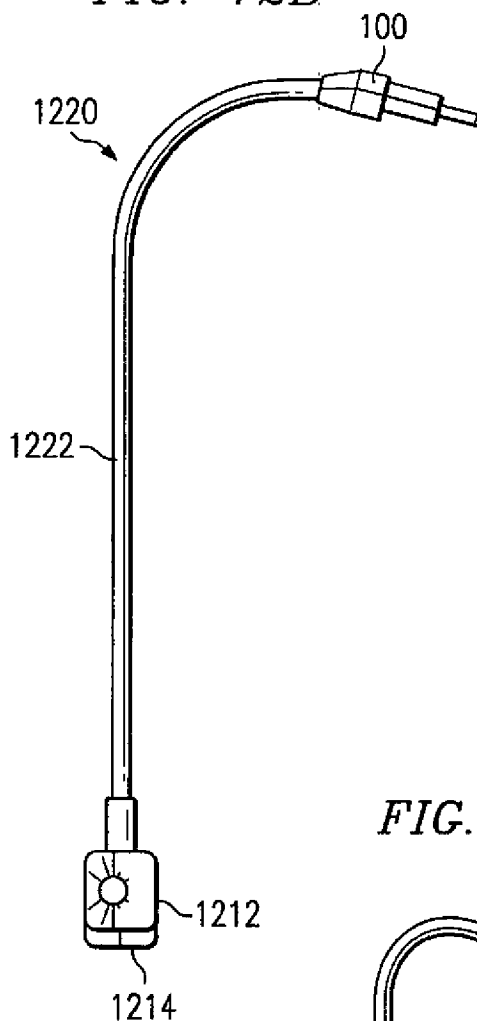
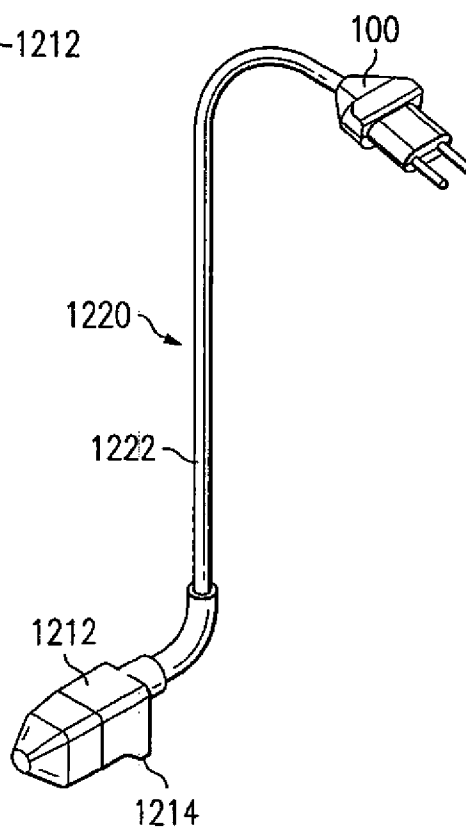


FIG. 12C



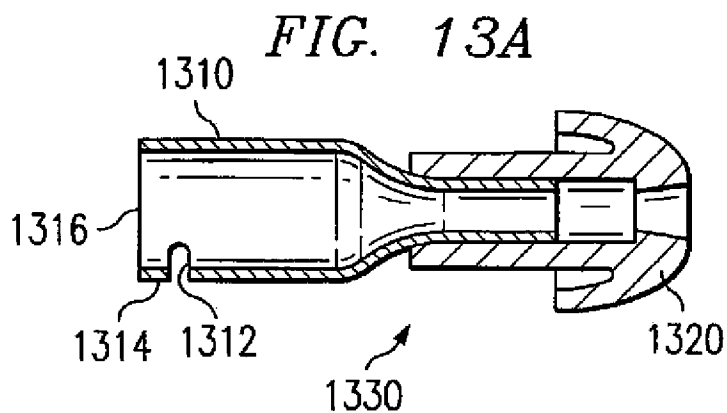
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**U.S. Patent**

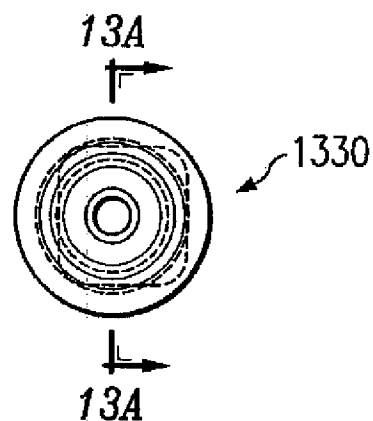
Sep. 19, 2006

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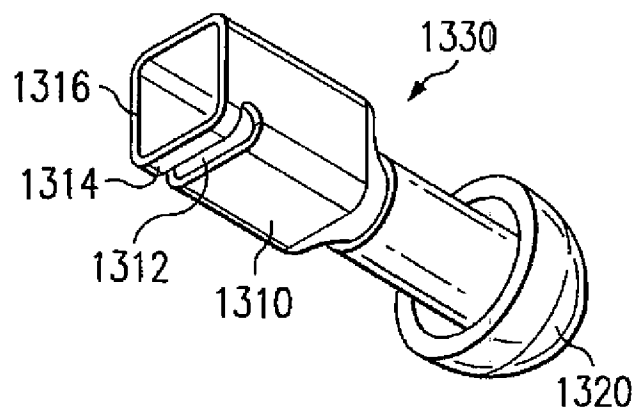
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*FIG. 13B*



*FIG. 13C*



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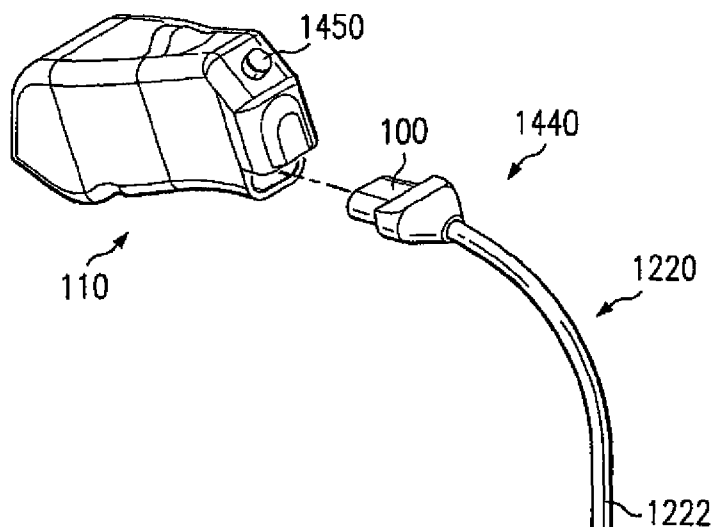
**U.S. Patent**

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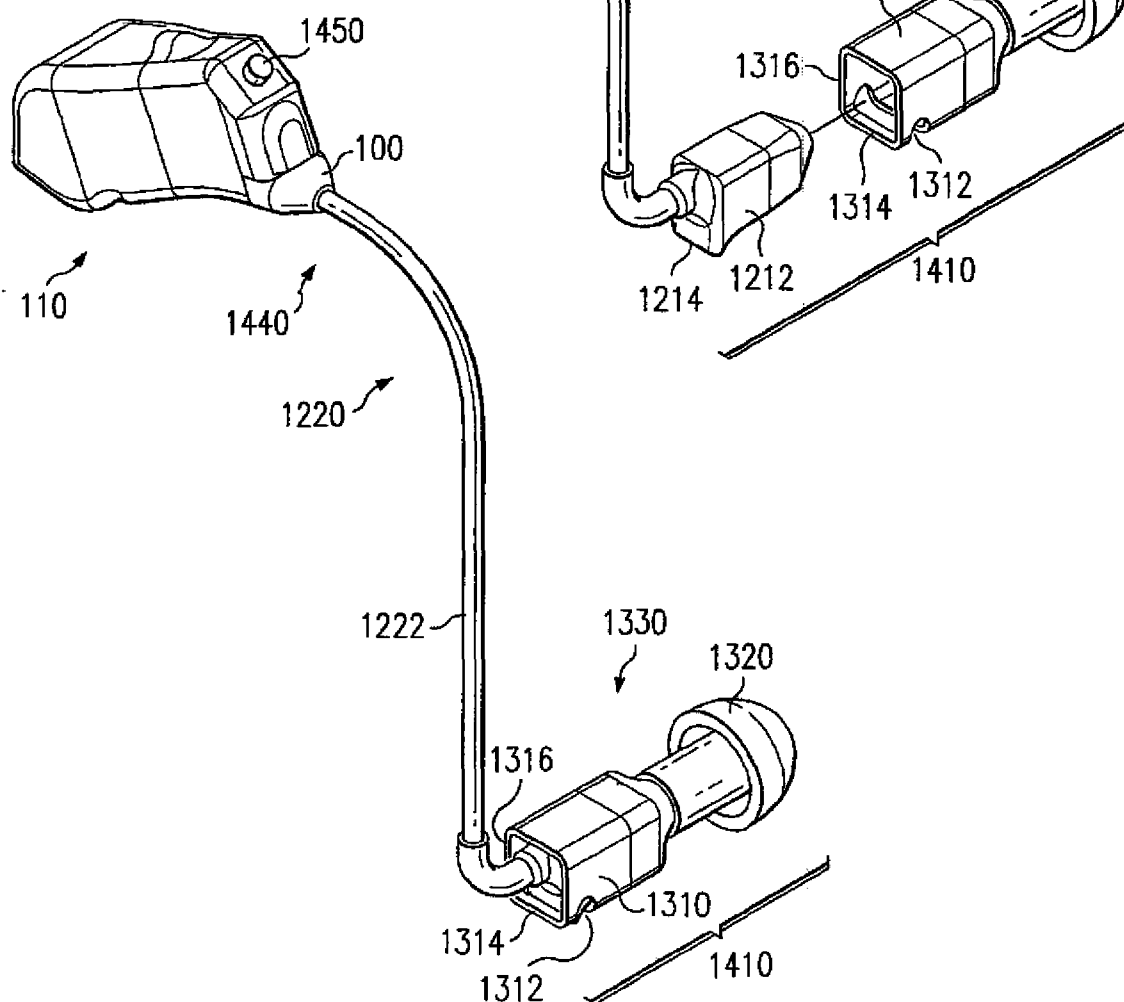
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**FIG. 14A**



**FIG. 14B**



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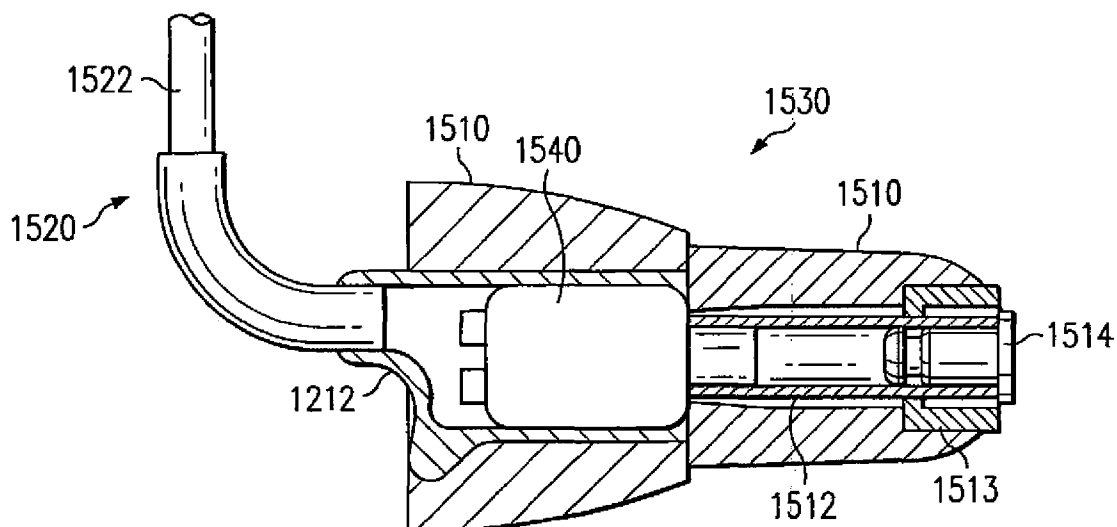
**U.S. Patent**

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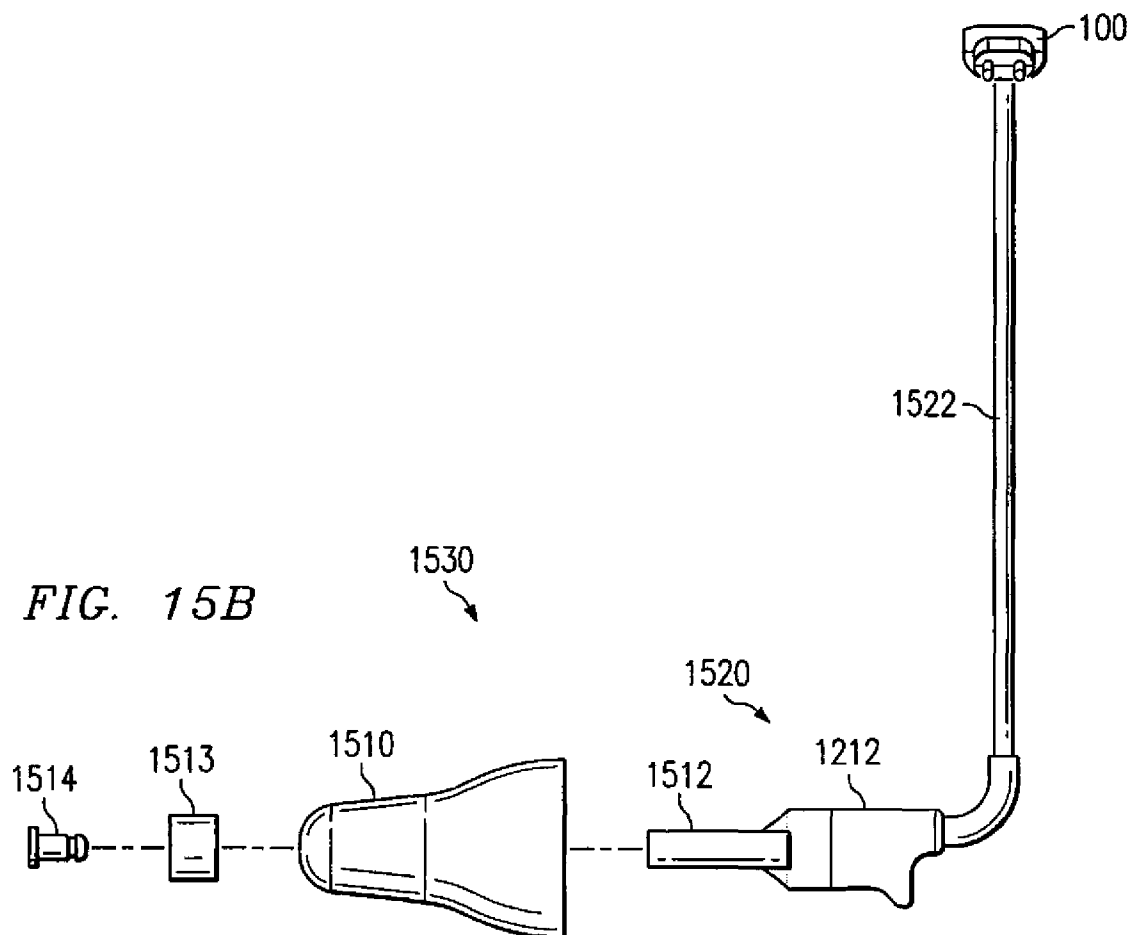
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*FIG. 15A*



*FIG. 15B*



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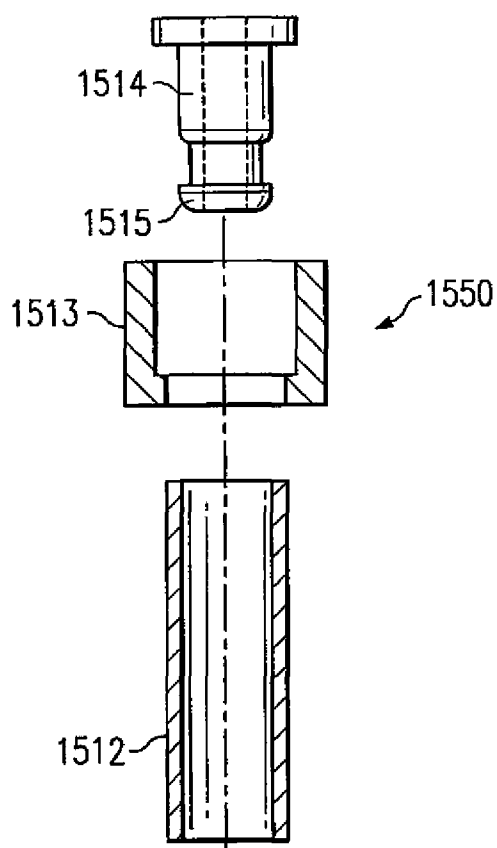
**U.S. Patent**

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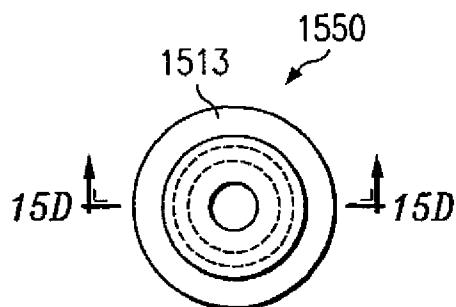
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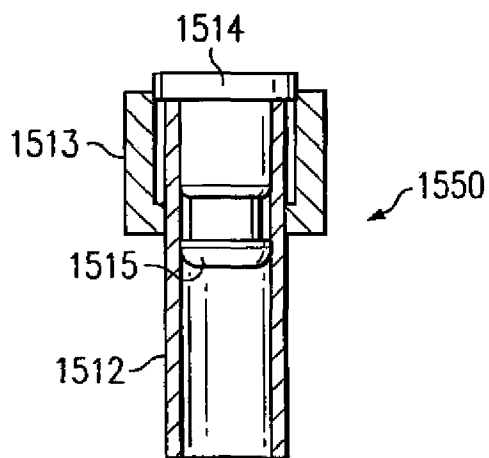
*FIG. 15C*



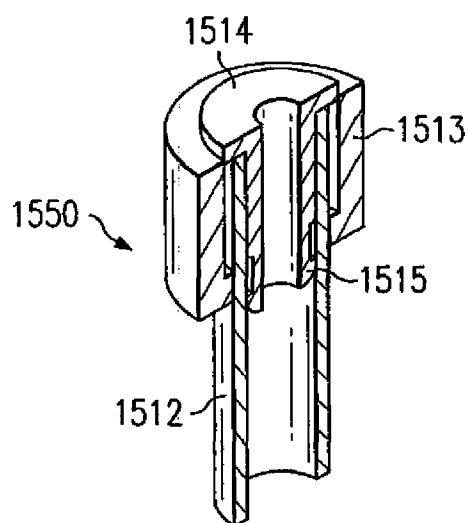
*FIG. 15E*



*FIG. 15D*



*FIG. 15F*



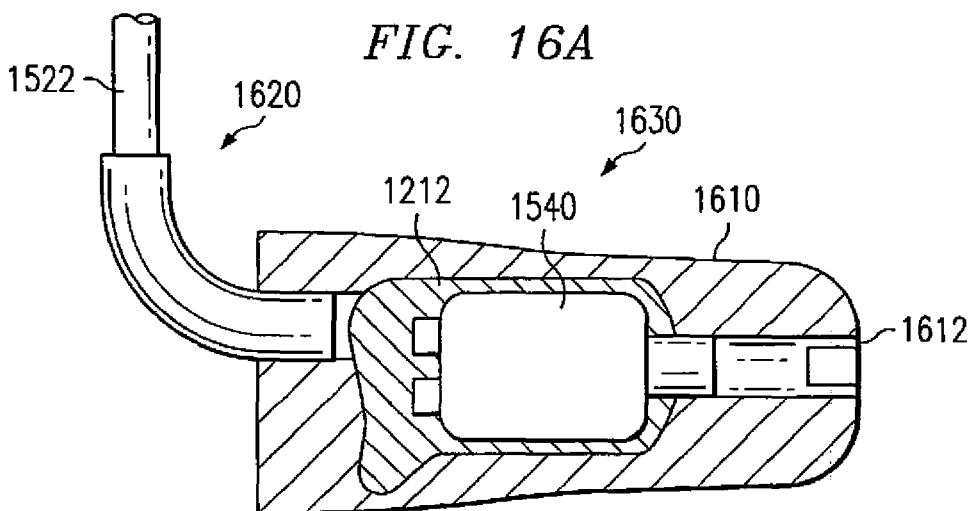
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**U.S. Patent**

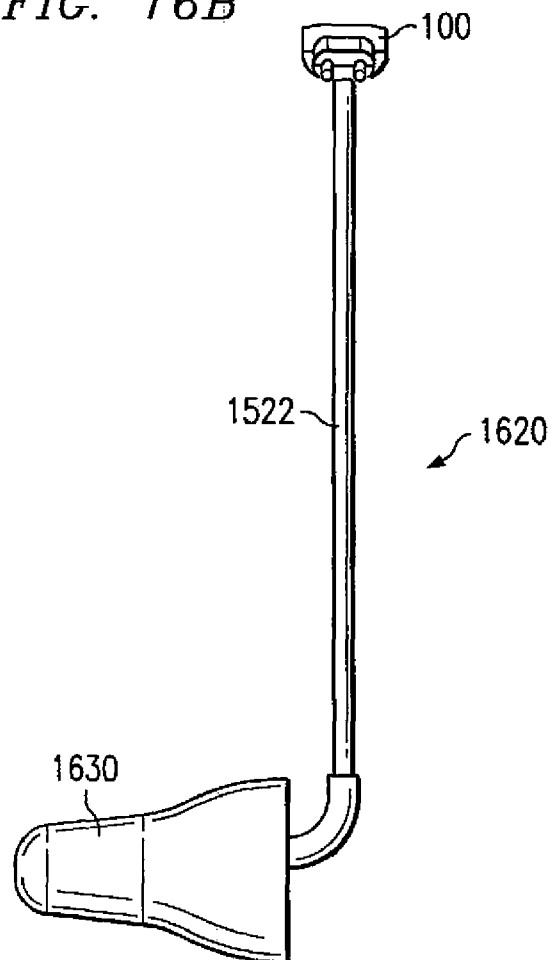
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*FIG. 16B*



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# 1

## BTE/CIC AUDITORY DEVICE AND MODULAR CONNECTOR SYSTEM THEREFOR

### CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation-in-Part claiming priority benefit of co-pending and commonly assigned U.S. patent application Ser. No. 09/927,891 entitled "A BTE/CIC AUDITORY DEVICE AND MODULAR CONNECTOR SYSTEM THEREFOR," filed Aug. 10, 2001, the disclosure of which is hereby incorporated herein by reference.

### TECHNICAL FIELD

This invention relates generally to auditory devices, and particularly to a hybrid behind-the-ear (BTE)/completely-in-canal (CIC) auditory device and a modular connector system therefor.

### BACKGROUND OF THE INVENTION

Conventional earpiece auditory devices (e.g., earphones, headphones, headsets, monitors, IFB devices, hearing aids, earplugs, etc.) are often bulky and uncomfortable for a user to wear. In addition, typically, these devices are cosmetically undesirable. For example, generally, use of one of these conventional devices may be easily discovered through casual observation of the user. However, in some circumstances, users may not want others to know they are using an earpiece auditory device. For example, oftentimes hearing aid users do not want others to know they are using such devices. As another example, news anchors using IFB devices may not want the device to be seen on camera. Moreover, use of a bulky and noticeable earpiece auditory device may potentially have more serious consequences. For example, a bulky, noticeable earpiece auditory device may put plain-clothed security personnel at risk of being discovered.

To overcome these problems, earpiece auditory devices have been developed wherein the entire device may be placed behind the ear of the user or within the ear of the user. However such devices, although possibly reducing some of the conspicuousness of the device, create their own set of problems.

For example, placing an auditory device within the outer portion of an ear canal of a user may cause the user to experience the occlusion effect, which is a plugged sensation that results when the ear canal is blocked and air conduction is impeded by the introduction of at least a portion of an earpiece auditory device into the outer portion of the ear canal. The ear canal (sometimes referred to as the external auditory meatus) has two zones: an outer zone and an inner zone. The outer zone, sometimes referred to as the cartilaginous region, makes up approximately two-thirds of the total length of the ear canal. The inner zone, referred to as the bony portion, accounts for the remaining one third of the length of the ear canal. The earlier mentioned plugged sensation is the result of the acoustic energy created by the vibration of the walls of the outer portion of the ear canal in response to a bone conducted signal. H. Gustav Mueller, "CIC Hearing Aids" What Is Their Impact On The Occlusion Effect?", *The Hearing Journal*, Vol. 47, No. 11, p. 29-35 (November 1994). This energy typically escapes when the ear canal is at least partially open. However, unfortunately, when an earpiece auditory device of sufficient

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size is placed in the outer portion of the ear canal, at least a portion of this energy is trapped in the user's ear, thereby causing the above described plugged sensation. In some existing earpiece auditory devices, a vent(s) or other means whereby bone-conducted energy may escape the ear canal is provided (e.g., the device is designed to leave the ear canal at least partially open), thereby minimizing or even eliminating the occlusion effect.

In addition, certain of the existing earpiece auditory devices (of both the behind the ear and within the ear or ear canal varieties) experience feedback problems. For example, some conventional earpiece auditory devices are designed with a microphone and speaker mounted to the same housing. As a result of such a design, the microphone and speaker are mechanically coupled to each other. One notably undesirable consequence of this mechanical coupling is electroacoustic feedback. Furthermore, in some conventional earpiece auditory devices, irrespective of the mounting of such components, a microphone and speaker of the device are situated in such close proximity to each other that feedback occurs. The above discussed feedback problems increase as the gain of the auditory device increases. As a result, the gain of such auditory devices are limited by the electroacoustic feedback.

In the past, efforts have been made to reduce such electroacoustic feedback by, e.g., physically separating the microphone and the speaker used in such devices. For example, *The Volta Review* January 1980, pp. 40-44, describes a hearing aid in which the receiver is separated from the main body of the aid and mounted in an ear mold that in turn is placed in the user's ear.

While such a design may result in reduced electroacoustic feedback, it would be commercially unacceptable. One reason for this is, similar to earlier discussions, the user will experience the occlusion effect on account of the introduction of the ear mold into the outer portion of the user's ear canal.

In addition to the above, existing earpiece auditory devices are typically designed such that the electrical components of the device (e.g., the speaker, receiver, microphone, etc., or whichever of such components are included in the particular device) are coupled to each other via some fixed connection. For example, in at least one instance, a speaker of an earpiece auditory device is electrically coupled (either directly or indirectly) to a microphone, processing circuitry, and/or a transceiver of a device via some form of fixed wiring. Such fixed wiring is typically done because of the protection from moisture or other undesirable elements that such fixed wiring normally provides to electrical couplings. In addition, fixed wiring is used because it occupies little of the scarce device space.

However, as a result of such fixed couplings, assembly of the devices and/or replacement of defective or expired parts is normally costly, time-consuming, and/or burdensome. To illustrate, currently, when some element of an earpiece auditory device needs to be replaced (e.g., a part has expired or is defective), in most circumstances, the user must return the device to the manufacturer or send the device to a repair lab.

Moreover, in some circumstances, at the manufacturer or the repair lab, the device must be taken apart, the defective or expired part(s) carefully removed, and a replacement part or parts inserted into the device and fixed (e.g., soldered) into place. Under such a process, it is usually several days or weeks before the auditory device is returned to the user.

In addition, for some earpiece auditory devices (e.g., some hearing aids, some ear plugs), at least a portion of the

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earpiece auditory device is normally manufactured to the specific dimensions of a particular user's ear structure and/or the user's intended use for the earpiece auditory device, as determined during a fitting of the user by a technician, representative, salesperson, etc. Although there are some advantages to this procedure (e.g., providing a desired fit to a particular user), one notable disadvantage to customizing these devices in this manner, at least to a manufacturer, is that such devices can then not be mass produced.

Furthermore, another disadvantage of this customizing of portions of earpiece auditory devices to a particular customer's ear shape is that if, upon delivery to the user, it is discovered that the fit of the auditory device is deficient in some manner, as was the case with replacing defective or expired parts, replacement of the ill-fitting earpiece is costly, time-consuming, and burdensome.

### BRIEF SUMMARY OF THE INVENTION

The present invention is directed to an earpiece auditory device. In one embodiment, the earpiece auditory device includes a behind-the-ear (BTE) component, preferably being shaped to fit behind an ear of a user. In some embodiments, the BTE component includes processing circuitry. In a preferred embodiment, the earpiece auditory device also includes a completely-in-canal (CIC) component, preferably being shaped to fit into the ear canal of the user in such a manner as to touch the bony portion of the ear canal.

In some embodiments, the CIC component includes either a universal fit or a custom fit ear mold. The custom fit ear mold can be fabricated using a rapid prototyping technology, in which the contours of the user's ear canal are scanned, and the scan data is used either directly or indirectly to replicate the contours of that particular user into the custom fit ear mold. In some embodiments, the ear mold is detachably interconnected with a speaker module, preferably using either a latching sleeve or a detachable locking pin arrangement. In another embodiment, the speaker module is permanently encapsulated within the ear mold. Moreover, in one embodiment, the earpiece auditory device includes a connector physically coupling the BTE component to the CIC component. In some implementations, the connector includes at least one end detachably coupled to the behind-the-ear component or the completely-in-canal component.

Technical advantages of embodiments of the present invention include ease of assembly, disassembly, reassembly, and/or the like, for an earpiece auditory device that reduces feedback, as well as the occlusion effect.

The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and specific embodiments disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. The novel features which are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to

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be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, reference is made to the following descriptions taken in conjunction with the accompanying drawing, in which:

FIG. 1 depicts an exploded isometric view of an exemplary embodiment of an earpiece auditory device in accordance with the present invention;

FIG. 2 depicts an exemplary embodiment of an assembled portion of the device of FIG. 1;

FIG. 3 depicts another exemplary embodiment of an earpiece auditory device in accordance with the present invention;

FIG. 4 depicts an unassembled portion of an exemplary embodiment of an earpiece auditory device in accordance with the present invention wherein a speaker is at least partially disposed within a speaker fastener;

FIG. 5 depicts an unassembled portion of an exemplary embodiment of an earpiece auditory device in accordance with the present invention prior to a speaker being at least partially disposed within a speaker fastener;

FIG. 6A depicts an exemplary embodiment of at least a portion of the elements of a processing module;

FIG. 6B depicts another exemplary embodiment of at least a portion of the elements of a processing module;

FIG. 7 depicts an exemplary embodiment of another assembled portion the device of FIG. 1;

FIG. 8 depicts an exemplary embodiment of an unassembled portion of the device of FIG. 1;

FIG. 9 depicts an exemplary embodiment of the device of FIG. 1 when assembled;

FIG. 10A depicts an exploded isometric view of a second exemplary embodiment of an earpiece auditory device in accordance with the present invention;

FIG. 10B depicts an exemplary embodiment of a connector and a processing module of FIG. 10A prior to coupling;

FIG. 10C depicts an exemplary embodiment of a connector and a processing module of FIG. 10B after coupling;

FIG. 11A depicts an exemplary embodiment of at least a portion of the elements of a processing module of the device of FIG. 10A;

FIG. 11B depicts a second exemplary embodiment of at least a portion of the elements of a processing module of the device of FIG. 10A;

FIGS. 12A–12C illustrate a potentially disposable link module integral with a speaker module 1212, in accordance with an alternative embodiment of the present invention;

FIGS. 13A–13C illustrate a universal tip module detachably interconnectable with a speaker module, in accordance with embodiments of the present invention;

FIGS. 14A–14B illustrate the assembly of a link module and a universal tip module into a behind-the-ear/completely-in-canal (BTE/CIC) earpiece auditory device embodiment, including BTE processing module, in accordance with embodiments of the present invention;

FIGS. 15A–15B depict a further embodiment of CIC/BTE earpiece auditory device, including a link module incorporating a custom ear mold fastened by a detachable locking pin;

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FIGS. 15C–15F illustrate details of the detachable locking pin assembly embodiment used in the link module embodiment of FIGS. 15A–15B; and

FIGS. 16A–16B depict an alternative earpiece auditory device, in accordance with embodiments of the present invention, having a custom ear mold directly encapsulated onto a link module.

#### DETAILED DESCRIPTION OF THE INVENTION

The inventors of commonly assigned U.S. Pat. No. 5,606, 621 issued Feb. 27, 1997, entitled “HYBRID BEHIND-THE-EAR AND COMPLETELY-IN-CANAL HEARING AID,” the disclosure of which is hereby incorporated herein by reference, developed a hybrid behind-the-ear (“BTE”)/completely-in-canal (CIC) hearing aid. In one embodiment, the hearing aid of the ’621 application has two components: a BTE component and a CIC component. Preferably, these components are mechanically isolated from each other. The BTE component, which is worn behind the ear, preferably includes at least a microphone. In one embodiment, the BTE also includes a power source, and sound processing circuitry (e.g., amplifiers, compressors, filters, etc.). Meanwhile, the CIC component is preferably shaped to fit into the ear canal of the patient in such a manner as to touch the bony portion of the ear canal. In one embodiment, the CIC component contains a speaker, the speaker preferably being operatively connected to the sound processing circuitry of the BTE component. In a preferred embodiment of the ’621 application, because the BTE and CIC components are mechanically isolated from each other, electroacoustic feedback is greatly reduced. Additionally, because in a preferred embodiment, the CIC component is located so deep in the patient’s ear canal as to touch the bony portion, the hearing aid does not cause the patient to experience the occlusion effect.

A preferred embodiment of the present invention expands upon the design of the hearing aid(s) disclosed in the ’621 application. FIG. 1 depicts an exploded isometric view of an exemplary embodiment of a BTE/CIC earpiece auditory device of the present invention. In the embodiment of FIG. 1, earpiece auditory device 40 includes completely-in-canal unit 10, connector 20, and behind-the-ear unit 30. Preferably, when in use, behind-the-ear unit 30 is placed behind an ear of a user, while completely-in-canal unit 10 is inserted so deep into the user’s ear canal as to touch the bony portion of the ear canal.

According to the illustrated embodiment, completely-in-canal unit 10 includes ear mold 11. Preferably, ear mold 11 is at least partially hollow on the inside. In one embodiment, completely-in-canal unit 10 also includes speaker receiving member 12, preferably at a first end of mold 11. Speaker receiving member 12 may be part of ear mold 11 itself or may be attached thereto (e.g., through an adhesive, screws, a detachable coupling, or some other fastening means). In some embodiments, receiving member 12 comprises a plate that includes opening 18. Furthermore, in one embodiment, member 12 also includes one or more speaker fastening grooves (e.g., groove 16). In addition to or in lieu of the above, in some embodiments, speaker receiving member 12 includes one or more mounting holes for receiving screws and/or other fastening means (e.g., mounting hole 9).

Ear mold 11 and/or speaker receiving member 12 may be made from hard material (e.g., acrylics), soft material (e.g., silicones or foam material), or some combination thereof. In one embodiment where mold 11 is made from hard material,

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at least a portion of the mold is covered with a foam boot or slip. The foam boot or slip may be fastened to mold 11 by numerous fastening means to include an adhesive, friction, screws, etc. Receiving member 12 may be made from the same or different material than that of ear mold 11.

The illustrated size and shape of ear mold 11 shown in FIG. 1 is by way of example only, for ear mold 11 may be of various different sizes and shapes, to include the dimensions of a particular user’s ear (e.g., the ear mold may be customized/tailored to a particular user). Ear mold 11 may also be such that it provides a universal fit that is satisfactory for a number of users. For example, at least a portion of mold 11 may be made from foam (or similar material) or covered with a foam slip (or like component), either of which is able to change shape (e.g., expand, compress, deform) to meet the dimensions of the user’s inner and/or outer ear. In addition, ear mold 11 may be transparent, translucent, or opaque, or some combination thereof.

In a preferred embodiment, ear mold 11 is of a particular size and shape such that completely-in-canal unit 10 may be placed so deep into a user’s ear canal as to touch the bony portion of the user’s hearing canal. In one embodiment, the ability to produce a completely-in-canal unit of a sufficient size to place the unit so deep into the user’s ear canal as to touch the bony portion is facilitated, at least in part, by limiting the number of elements included in completely-in-canal unit 10.

Moreover, in a preferred embodiment, in addition to ear mold 11, completely-in-canal unit 10 includes speaker 13. Any speaker suitable for use in an earpiece auditory device may be used as speaker 13 (e.g., earpiece device speakers available from Knowles Electronics, Inc.). It will be appreciated that the speaker of an earpiece auditory device is also known in the art as a “receiver”. The term “speaker” is used here to avoid confusion with other possible components of device 40 described in detail below.

In some embodiments, in addition to the above, completely-in-canal unit 10 includes speaker fastener 14. Speaker fastener 14 may be made from any one of numerous suitable materials to include plastics and/or metals. In one embodiment, speaker fastener 14 includes one or more projections (e.g., projection 15). Moreover, in some embodiments, one or more of the projections of speaker fastener 14 include appendage 19. Furthermore, in one embodiment, in addition to or in lieu of the above, speaker fastener 14 includes one or more mounting holes (e.g., mounting hole 8) for securing speaker fastener 14 to ear mold 11 and/or receiving member 12 using screws or other fastening means.

In a preferred embodiment, the configuration of fastener 14 is such that at least a portion of speaker 13 fits within an area, at least partially, defined by fastener 14. For example, in one embodiment, as part of assembling device 40, speaker 13 is, at least partially, disposed within space 17 (as shown in FIG. 4). As can be in FIG. 5, space 17 is, at least partially, defined by a surface of speaker fastener 14. In the embodiments of FIGS. 4 and 5, the projection(s) of fastener 14 may help guide speaker 13 into space 17.

In some embodiments, speaker 13 is communicatively (e.g., electrically) and/or physically coupled to speaker fastener 14. Speaker 13 and fastener 14 may be fixedly coupled, such as the hard-wire coupling depicted in FIG. 1. On the other hand, speaker 13 and fastener 14 may be detachably coupled, e.g., through the detachable electrical hole and prong arrangement shown in FIG. 5. In some embodiments (e.g., the embodiments of FIGS. 4 and 5), at least a portion of speaker fastener 14 acts as a guard to protect the communicative coupling between speaker 13 and

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speaker fastener 14 from one or more undesirable elements (e.g., cerumen, moisture, and the like) that may be present in the environment in which speaker 13 and fastener 14 are used. Accordingly, preferably in such embodiments, speaker fastener 14 facilitates an insulated communicative coupling between speaker 13 and fastener 14.

As mentioned, preferably, ear mold 11 is at least partially hollow on the inside. Accordingly, in one embodiment, ear mold 11 may receive internally one or more other elements of device 40. In some embodiments, at least a portion of speaker fastener 14, along with speaker 13, which may be partially disposed therein, are passed through opening 18 in receiving member 12 and into ear mold 11 (e.g., the assembled portion of device 40 shown in FIG. 2). Similar to earlier discussions, in a preferred embodiment, speaker 13 and/or speaker fastener 14 are of a particular size and shape such that when speaker 13 and/or speaker fastener 14 are coupled to ear mold 11, the assembly of ear mold 11, speaker 13, and/or speaker fastener 14 may be placed so deep into a user's ear canal as to touch the bony portion of the user's ear canal.

Moreover, in one embodiment, speaker fastener 14 and/or speaker 13, are securely (and, in one embodiment, detachably) coupled to ear mold 11 and/or receiving member 12. In some embodiments, such a secure (preferably detachable) connection is facilitated by the projection(s) of fastener 14 engaging the fastening groove(s) of receiving member 12. In one of these embodiments, appendage 19 of the projection(s) engages the fastening groove(s). In addition to or in lieu of the above, speaker fastener 14 and/or speaker 13 may be secured to ear mold 11 and/or speaker receiving member 12 by passing at least a portion of a screw(s) or other fastening means through the mounting holes of receiving member 12 and speaker fastener 14 (e.g., the assembled portion of FIG. 2). In a preferred embodiment, the coupling between fastener 14, ear mold 11, and/or receiving member 12 is of sufficient strength such that unit 10 may be removed from the user's ear canal by pulling on connector 20.

Accordingly, speaker 13, fastener 14, receiving member 12, and/or ear mold 11 can be securely fastened together. However, in some embodiments, some or all of these elements can also be conveniently attached to and detached from each other, thus allowing for convenient and easy assembly and/or disassembly of earpiece device 40, as well as allowing for the replacement of any inoperative, defective, or otherwise unsatisfactory parts with relative ease.

For instance, if speaker 13 fails for some reason (e.g., speaker 13 is defective or the speaker simply becomes inoperative (a common earpiece auditory device malady)), in one embodiment, connector plate 14, with speaker 13 disposed therein, may be detached from ear mold 11, e.g., by depressing portions of ear mold 11, member 12, and/or fastener 14, thereby releasing the appendages of fastener 14, and pulling fastener 14 from ear mold 11. In addition to or in lieu of the above, in one embodiment, speaker connector plate 14 is detached from ear mold 11 and/or receiving member 12 by removing screws coupling fastener 14 to receiving member 12.

Furthermore, in one embodiment, after its removal from the inside of mold 11, speaker 13 may be separated from fastener 14 through the application of a pulling force (e.g., where speaker 13 and fastener 14 are coupled via a hole and prong arrangement). Thereafter, in one embodiment, the replacement speaker may be coupled to fastener 14 by pressing the electrical prongs of fastener 14 into the receiving holes of the replacement speaker (or vice versa). Then, in some embodiments, speaker fastener 14, and the attached

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replacement speaker, may be passed through receiving member 12 until the appendages of fastener 14 engage the grooves of receiving member 12.

In one embodiment, completely-in-canal unit 10 has an open mold configuration, meaning the ear canal of a user is at least partially open when completely-in-canal unit 10 is inserted so deep into the user's ear canal as to touch the bony portion. Moreover, in some embodiments, completely-in-canal unit 10 (e.g., ear mold 11) includes a vent(s) by which sound waves may pass over and/or through unit 10. In an embodiment of completely-in-canal unit 10 wherein unit 10 includes a vent(s), unit 10 also includes a filter to keep cerumen, dirt, moisture, and other undesirable elements from entering unit 10.

Furthermore, in one embodiment, the dimensions of a surface of receiving member 12 are such that member 12 may be flush with a surface of ear mold 11 (as an example, the assembled portion of device 40 shown in FIG. 2). Moreover, in one embodiment, at least one dimension of receiving member 12 is initially larger, in some instances substantially larger, than a dimension of ear mold 11 (an example of such a receiving member is depicted in FIG. 3). Then, as part of the assembly of device 40 in such embodiments, speaker receiving plate 12 is ground down or otherwise reduced in size, so as to be flush with a surface of ear mold 11.

The size and shape of the elements of unit 10, as well as the arrangement of the elements, depicted in FIG. 1 are by way of example only, for the elements may be of a different size and shape, as well as arranged in a manner different from that which is depicted in FIG. 1. Moreover, elements not depicted in FIG. 1 may be included in unit 10. For example, in one embodiment speaker fastener 14 or receiving member 12 includes a retrieval line for aiding a user in retrieving and/or inserting unit 10 into and out of the user's ear canal. Furthermore, elements included in FIG. 1 may be absent from unit 10. For example, in one embodiment, at least one of the elements of completely-in-canal unit 10 depicted in FIG. 1 is included as part of connector 20, behind-the-ear unit 30, and/or some portion of device 40 other than completely-in-canal unit 10. For instance, in some embodiments, speaker fastener 14 is part of connector 20, rather than unit 10. In addition to or in lieu of the above, in one embodiment, speaker 13 is part of connector 20, rather than unit 10.

In a preferred embodiment, in addition to completely-in-canal unit 10, earpiece auditory device 40 includes behind-the-ear unit 30. In a preferred embodiment, unit 30 includes processing module 33. In one embodiment, module 33 includes housing 37 (housing 37 preferably being made from plastic). Furthermore, in some embodiments, module 33 includes at least one or some combination of a microphone(s), a communications link(s), processing circuitry (which may include sound processing circuitry), and/or a power source. Preferably, the above described elements of module 33 are integrated with housing 37.

Any microphone suitable for use in an earpiece auditory device may be employed as the microphone(s) in embodiments of module 33 (e.g., microphones available from Knowles Electronics, Inc.). Moreover, the microphone(s) may be either omni, directional, or some combination thereof.

In addition, the earlier mentioned processing circuitry (which, in one embodiment, includes sound processing circuitry) may include any and all hardware, software, firmware, and/or the like, necessary for the intended operation of the earpiece auditory device. As non-limiting

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examples, the processing circuitry may include an amplifier(s) (in one embodiment, multi-channel and programmable), compressor(s), filter(s), packetizing circuitry, depacketizing circuitry, modulation circuitry, conversion circuitry, and/or the like. Such circuitry may include analog, programmable analog, digital circuitry, and/or a combination thereof. In one embodiment, the processing circuitry processes electrical (and/or other) signals that are to be provided to speaker 13, where the signals are converted to acoustic waves. In addition to or in lieu of the above, in one embodiment, the processing circuitry processes electrical (and/or other signals) for transmission (be it wireline or wireless) to a remote device(s).

Moreover, in a preferred embodiment, the earlier mentioned communications link enables device 40 to communicate with a remote device (e.g., via wireline and/or wireless transmissions). In one embodiment, the communications link includes a wireless input receiver for receiving wireless transmissions (e.g., a radio frequency (RF) receiver or a magnetic induction coil), a transmitter for broadcasting wireless transmissions, and/or combinations thereof (e.g., a transceiver). These wireless transmissions may be radio RF transmissions, optical transmissions (e.g., infrared), magnetic induction transmissions, acoustic waves (e.g., ultrasonic), capacitive coupling transmissions, as well as other forms of wireless communications. In some embodiments, the wireless receiver, transmitter, etc., of the communications link includes accompanying circuitry.

With respect to the above discussed power source, in one embodiment, the power source of module 33 is a battery. In some embodiments, the power source of module 33 is re-chargeable. Furthermore, in one embodiment, the power source is external to module 33 (e.g., an adapter).

Preferably, the particular element or combination of elements that is included as part of a particular embodiment of module 33, as well as the make up of each element, depends upon the intended use of the particular embodiment of earpiece auditory device 40. For example, when earpiece auditory device 40 is to be used to convert acoustic waves from the user's environment into representations of the acoustic waves via electrical (and/or other) signals, whereby the signals are then processed and provided to speaker 13 (e.g. when device 40 is to be used as a hearing aid), module 33 preferably includes at least a microphone(s), processing circuitry, and a power source.

An example of such an embodiment of module 33 is provided in FIG. 6A. As illustrated, at least a portion of the interior of module 33 includes a connector 60 for communicatively (preferably detachably) and/or physically coupling module 33 to module fastener 31 (shown in FIG. 1) and/or connector 20. In one embodiment, such a communicative coupling is an electrical coupling. Preferably, connector 60 is communicatively (e.g., electrically) coupled to processing circuitry 61, which may include sound processing circuitry. In one embodiment, processing circuitry 61 is also communicatively coupled to microphone 62. Preferably, shuttle 33 also includes power source 63 (e.g., a battery).

In some of the above discussed embodiments, the sound processing circuitry of processing circuitry 61 includes high gain circuitry. However, in some embodiments, the sound processing circuitry may be low or no gain circuitry. Moreover, in some of the above embodiments, device 40 may amplify some sounds, while allowing other sounds to be provided to speaker 13 without amplification. Furthermore, in one embodiment, device 40 may allow some sounds to be provided directly to the user's ear drum without first being

converted into electrical (and/or other) signals (e.g., the earpiece device is an open mold configuration and/or includes a vent(s)).

Furthermore, in one embodiment, the sound processing circuitry of module 33 includes sound amplitude reduction circuitry. For example, in some embodiments, earpiece auditory device 40 may be used as an electronic earplug or other sound reduction device. In one of these embodiments, module 33 includes sound amplitude reduction circuitry whereby sounds received at the microphone are reduced (sometimes greatly reduced) in volume before being provided to speaker 13, if such sounds are not eliminated altogether by the circuitry. Moreover, in one of these sound reduction embodiments, device 40 may reduce the volume or eliminate certain sounds, while allowing other sounds to be provided to speaker 13 or directly to the user's ear drum (e.g., the earpiece device is an open mold configuration and/or includes a vent(s)).

In embodiments where earpiece auditory device 40 is to be used in a manner wherein electrical and/or other signals are to be directly inputted (either by wired or wireless transmissions) to device 40 and/or transmitted by device 40 (in wired or wireless form), e.g., when used as an earphone, monitor, or IFB device, module 33 preferably includes at least the earlier mentioned communications link, processing circuitry, and a power source. In one of these embodiments, the sound processing circuitry included in the processing circuitry of module 33 is high gain, low gain, no gain, and/or sound reduction circuitry.

An example of such an embodiment of module 33 is provided in FIG. 6B. As illustrated, at least a portion of the internal elements of module 33 includes connector 60 for communicatively (preferably detachably) and/or physically coupling module 33 to module fastener 31 and/or connector 20. Similar to FIG. 6A, in one embodiment, connector 60 is communicatively (e.g., electrically) coupled to processing circuitry 61, which may include sound processing circuitry. However, rather than being coupled to a microphone as in FIG. 6A, circuitry 61 is communicatively coupled to communications link 64. In the illustrated embodiment, shuttle 33 also includes power source 63 (e.g., a battery).

Furthermore, in embodiments where device 40 is to be used to receive and/or transmit data or other transmissions via a wired or wireless means to and/or from a remote device, e.g., a computer device (such as audio files, MP3 files, voice streams, video streams, Internet broadcasts, etc.) and/or a cell phone, preferably the communications link and/or processing circuitry of shuttle 33 is compliant with the various transmission formats, protocols (e.g., TCP/IP, Bluetooth), and/or interfaces necessary to receive and process the transmissions.

Moreover, in some embodiments, device 40 may be used to directly receive and/or transmit electrical (and/or other) signals, as well as convert acoustic waves into electrical (and/or other) signals. For example, in one embodiment, device 40 may convert the user's voice and/or other acoustic waves from the environment into electrical (and/or other) signals. Moreover, such signals may be processed and transmitted to speaker 13. In addition, such signals may be processed and transmitted to a remote device(s) (e.g., a cell phone, an intercom system). Furthermore, device 40 may receive signals from the remote device(s). In one of these embodiments, at least a portion of the interior of module 33 resembles the embodiment of FIG. 6A with the addition of communications link 64 communicatively coupled to processing circuitry 61.

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Furthermore, in one embodiment, in addition to module 33, behind-the-ear unit 30 includes module fastener 31. In some embodiments, module fastener 31 facilitates the coupling of module 33 to connector 20. In one embodiment, at least a portion of module fastener 31 is made from plastic. Moreover, module fastener 31 may be transparent, translucent, opaque, and/or a combination thereof. In FIGS. 1 and 8, for purposes of illustration only, a portion of fastener 31 has been removed to enable the electrical prongs of one embodiment of device 40 to be seen.

In one embodiment, when earpiece auditory device 40 is assembled, fastener 31 is securely (preferably detachably) coupled to module 33 (as shown in FIG. 7). For example, in one embodiment, fastener 31 is of such a shape that it slips over at least a portion of module 33. Moreover, in one embodiment, fastener 31 includes one or more fastening projections (e.g., fastening projection 34) that engage one or more fastening notches of module 33 (e.g., notch 35) when fastener 31 is slipped over module 33 (thereby securing the attachment). In one of these embodiments, the one or more fastening projections include an appendage(s) for engaging the fastening notches. In addition to or in lieu of the above, fastener 31 may be coupled to module 33 by other means (e.g., screws, adhesives, and/or other fastening means). In a preferred embodiment, the coupling between fastener 31 and module 33 is of sufficient strength that completely-in-canal unit 10 may be removed from within the user's ear canal by pulling on connector 20, without separating fastener 31 from module 33. Furthermore, in one embodiment, the coupling between fastener 31 and module 33 is of sufficient strength that behind-the-ear unit 30 may be removed from behind the user's ear by pulling on connector 20.

In some embodiments, module 33 and fastener 31 can be detached from and/or reattached to each other. In one embodiment, this may be accomplished by depressing a surface(s) of fastener 31 and pulling the two pieces apart (e.g., an embodiment where the projection(s) of fastener 31 engage the notch(es) of shuttle 33). In one embodiment, module 33 may be detached from fastener 31 by removing screws coupling the two components together.

Furthermore, in some embodiments, module 33 is communicatively (e.g., electrically) coupled to fastener 31. In one embodiment, the communicative coupling between module 33 and fastener 31 is fixed, e.g., hard-wired. In an alternative embodiment, the communicative coupling between shuttle 33 and fastener 31 is detachable, e.g., the detachable prong and hole connection shown in FIGS. 1 and 8. In one embodiment where fastener 31 is communicatively coupled to module 33, at least a portion of fastener 31 acts as a guard to protect the communicative coupling between fastener 31 and module 33 from one or more undesirable elements (e.g., moisture, dirt particles, etc.) that may be present in the environment in which unit 30 is used (e.g., the embodiments of FIGS. 1 and 8). Thereby, in such embodiments, fastener 31 preferably facilitates an insulated communicative coupling between the fastener and module. Moreover, in one embodiment, the projections of fastener 31 may help align electrical prongs of fastener 31 with receptacle holes of module 33 (or vice versa).

In addition, in some embodiments, fastener 31 includes a plurality of holes 36 that facilitate the passage of sound through fastener 31 and/or into module 33. In some of these embodiments, a filter 32 is included within fastener 31 to prevent foreign and unwanted particles (e.g., dirt and moisture) from getting inside fastener 31 and/or passing into module 33. In one embodiment, when the filter is no longer capable of providing satisfactory protection, the filter may

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be replaced by separating fastener 31 and module 33 (e.g., in the manner described above), removing the old filter from fastener 31, and placing a new filter therein. In some embodiments, rather than being included as part of fastener 31, filter 32 is part of module 33.

Preferably, module fastener 31 and/or module 33 are shaped so as to funnel sounds into the interior of module 33. For example, in one of the embodiments where module 33 includes a microphone, module fastener 31 and/or module 33 may be shaped so as to funnel sounds towards the microphone.

Moreover, as mentioned, in a preferred embodiment, when in use, behind-the-ear unit 30 is placed behind the cartilage of the user's ear. In one embodiment, fastener 31 and/or module 33 are of such size and shape that they are invisible to the casual observer when placed behind the cartilage of the user's ear. In addition, in some embodiments, fastener 31 and/or module 33 includes (or forms) an earhook that enables unit 30 to sit on top of the user's ear.

As discussed, in one embodiment, module 33 and fastener 31 can be securely fastened together. However, preferably, these individual elements can be easily detached from and reattached to each other, thus allowing for convenient assembly and disassembly, as well as replacement of any inoperative, defective, or otherwise unsatisfactory parts. For instance, if module 33 fails for some reason (e.g., moisture shorts the processing circuitry), in some embodiments, module 33 and fastener 31 can be detached from each other (in one embodiment, by depressing a surface(s) of fastener 31 and pulling the two pieces apart). A replacement module can then be selected. Afterwards, in one embodiment, fastener 31 can be coupled to the replacement module by slipping the fastener over the replacement module until the projections of fastener 31 engage the notches of the replacement module.

The dimensions and arrangement of the elements of behind-the-ear unit 30 shown in FIG. 1 is by way of example only, as the elements may be of a different size and shape, as well as arranged in a manner different from that which is depicted in FIG. 1. In addition, elements not depicted in FIG. 1 may be included in unit 30. On the other hand, elements included in FIG. 1 may be absent from unit 30. Furthermore, rather than being part of unit 30, some of the elements of unit 30 depicted in FIG. 1 may instead be part of connector 20, speaker module 10, or some portion of earpiece auditory device 40 other than MRP module 30. For example, in one embodiment, fastener 31 is part of connector 20.

In addition to the above, in one embodiment, connector 20 physically (preferably detachably) couples completely-in-canal-unit 10 to behind-the-ear unit 30. In a preferred embodiment, connector 20 includes at least one end that may be detachably physically coupled to unit 10 or unit 30. Also, in one embodiment, as part of the physical coupling of behind-the-ear unit 30 to completely-in-canal unit 10, connector 20 communicatively (e.g., electrically) couples completely-in-canal unit 10 to behind-the-ear unit 30. Moreover, in one embodiment, at least one of the earlier mentioned one or more ends of connector 20 that may be detachably physically coupled to unit 10 or unit 30 may be detachably communicatively coupled to unit 10 or unit 30.

In some embodiments, connector 20 includes hollow tubing 21 (preferably insulated and made from plastic). In one of these embodiments, wire cable(s) 22 is disposed within tubing 21. Preferably, only two or three wire cables are disposed within tubing 21. However, a greater or fewer number of wires can be disposed therein. For example, the processing circuitry of module 33 may require a greater or lesser number of wire cables within tubing 21. In an alter-

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native embodiment, unit 10 and unit 30 are communicatively coupled via a wireless connection, and thus, wire cable(s) 22 are not present. Furthermore, as discussed earlier, in some embodiments, speaker 13, speaker fastener 14 and/or module fastener 31 are part of connector 20.

Preferably, wire cable(s) 22 is communicatively (e.g., electrically) and/or physically coupled to speaker fastener 14 (e.g., coupling 23 of FIG. 1). The communicative and/or physical coupling between wire cable(s) 22 and speaker fastener 14 may be fixed, such as through hard-wiring. On the other hand, the coupling between wire cable(s) 22 and speaker fastener 14 may be detachable, e.g., through a detachable electrical prong and hole arrangement.

Similarly, in one embodiment, wire cable(s) 22 is communicatively (e.g., electrically) and/or physically coupled to module fastener 31 (e.g., coupling 24 of FIG. 1). As was the case with respect to speaker fastener 14, the communicative coupling between wire cable(s) 22 and module fastener 31 may be fixed, such as through hard-wiring. On the other hand, the communicative coupling between wire cable(s) 22 and module fastener 31 may be detachable, e.g., through a detachable prong and hole arrangement.

In a preferred embodiment, connector 20 is of sufficient length to physically and/or communicatively couple unit 30 to unit 10 when unit 30 is placed behind-the-ear of a user and unit 10 is placed within the ear canal of a user so far as to touch the bony portion of the ear canal. Moreover, when in use, preferably a first portion of connector 20 is at least within the ear canal of the user. In some embodiments, e.g., when speaker 13 and/or speaker fastener 14 are part of connector 20, similar to the manner discussed earlier with respect to unit 10, a portion of connector 20 is inserted within and coupled to ear mold 11 of unit 10, e.g., through receiving member 12 (e.g., the assembled portion of device 40 depicted in FIG. 2). Accordingly, in one embodiment, a portion of connector 20, when in use, is part of an assembly that includes ear mold 11 and receiving member 12 of unit 10 that may be inserted so deep within the user's ear canal as to touch the bony portion. Furthermore, when in use, preferably a second portion of connector 20 is located behind the ear of the user (to include embodiments where fastener 31 is not part of connector 20). In addition, preferably, the dimensions of connector 20 are such that those portions of connector 20 not in the bony portion or outer portion of the user's ear canal or behind the user's ear are taut against the head of the user when device 40 is in use. In a preferred embodiment, the dimensions of connector 20 are such that connector 20 is indiscernible to one casually viewing the user when device 40 is in use.

Accordingly, completely-in-canal unit 10, connector 20, and behind-the-ear unit 30 may be physically and/or communicatively coupled together. In a preferred embodiment, one or more of these couplings are detachable, such that, unit 10 and/or unit 30 can be easily attached to and detached from connector 20 or vice versa, thus allowing for convenient and easy assembly of auditory device 40, as well as relatively easy replacement of any inoperative, defective, or otherwise unsatisfactory parts.

For instance, if connector 20 is deficient for some reason (e.g., a wire has failed and/or connector 20 is too long and thus is cosmetically undesirable when the device is in use), in one embodiment, the end of connector 20 coupled to unit 10 may be easily detached (at least relatively speaking) from unit 10 by pulling the pieces apart (e.g., embodiments where connector 20 is detachably coupled to fastener 14, such as through a hole and prong arrangement). Furthermore, in one embodiment, connector 20 may be detached from unit 30 by

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pulling apart a detachable coupling between connector 20 and fastener 31 (e.g., when connector 21 and fastener 31 are coupled via a hole and prong arrangement). In addition, an acceptable replacement connector may be selected. Afterwards, in one embodiment, one end of the replacement connector may be coupled to unit 10 by pushing fastener 14 and connector 20 together (e.g., a hole and prong coupling), while a second end of the replacement connector may be coupled to unit 30 by pushing connector 20 and fastener 31 together (e.g., a hole and prong coupling as well).

In some of the embodiments where speaker fastener 14 and/or module fastener 31 are part of connector 20, connector 20 may be separated from ear mold 11 by depressing a portion(s) of ear mold 11, receiving member 12, and/or fastener 14 and pulling fastener 14 from ear mold 11. In embodiments where speaker 13 is part of unit 10, fastener 14 may then be removed from unit 10 by pulling speaker 13 from fastener 14 (e.g., where fastener 14 and speaker 13 are coupled via a hole and prong arrangement). In addition, in one embodiment, connector 20 may be separated from unit 30 by depressing a portion(s) of fastener 31 and pulling fastener 31 from module 33. A new connector may then be coupled (or the previous connector re-coupled) to unit 10 and/or unit 30 via one of the earlier described means for coupling fastener 14 to speaker 13 and ear mold 11 and/or coupling fastener 31 to shuttle 33.

Similar to earlier discussions, in a preferred embodiment, the coupling between connector 20 and unit 10 is of sufficient strength such that unit 10 may be removed from within the user's ear canal by pulling on connector 20. Moreover, in addition to or in lieu of the above, in one embodiment, the coupling between connector 20 and unit 30 is of sufficient strength such that unit 30 may be removed from behind the user's ear by pulling on connector 20.

The size, shape, dimensions, etc., of connector 20 shown in FIG. 1 are by way of example only, as connector 20 can be of numerous sizes and shapes. In addition, elements not depicted in FIG. 1 may be included in connector 20. For example, in one embodiment where speaker fastener 14 is part of connector 20, fastener 14 includes a retrieval line for aiding a user in retrieving and/or inserting unit 10 into and out of the user's ear canal. On the other hand, elements included in FIG. 1 may be absent from connector 20. Moreover, as mentioned, in at least one embodiment, connector 20 includes speaker 13, fastener 14, and/or fastener 31.

FIG. 9 depicts the embodiment of earpiece auditory device 40 shown in FIG. 1 after the embodiment of device 40 has been assembled. Again, it will be appreciated that the elements of device 40, as well as the arrangement of these elements, depicted in 9 are by way of example only, for earpiece auditory device 40 may have several configurations.

As a non-limiting example of such, FIGS. 10A, 10B, and 10C depict an alternative embodiment of earpiece auditory device 40. In the embodiment of FIG. 10A, similar to the embodiment illustrated in FIG. 1, earpiece auditory device 40 includes ear mold 11, speaker receiving member 12, speaker 13 and speaker fastener 14. The earlier discussions regarding ear mold 11, speaker receiving member 12, speaker 13 and speaker fastener 14 apply equally as well to the embodiments of these elements present in the embodiment of FIG. 10A.

Also similar to the embodiment of FIG. 1, device 40 also includes connector 20. The above discussions regarding connector 20 also apply equally as well to connector 20 of FIG. 10A. However, in the embodiment of FIG. 10A, rather

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than potentially including module fastener 31, connector 20 instead includes module fastener 100. Preferably, module fastener 100 is operable to plug into connector receptacle 120 of processing module 110 (as shown in FIGS. 10B and 10C).

Processing module 110 of FIGS. 10A, 10B, and 10C is similar to module 30, one difference being that module 110 does not potentially include fastener 31. Otherwise, the above discussions regarding module 30 apply equally as well to module 110.

Exemplary embodiments of at least a portion of the interior of module 110 are depicted in FIGS. 11A and 11B. In the embodiment of FIG. 11A, at least a portion of the interior of module 110 includes a connector 160 (which preferably includes receptacle 120) for communicatively (e.g., electrically) and/or physically coupling module 110 to connector 20. In one embodiment, such a coupling(s) is detachable. Moreover, in one embodiment, connector 160 is communicatively coupled to processing circuitry 140 (similar to earlier discussions, such processing circuitry may include sound processing circuitry). In the illustrate embodiment, processing circuitry 140 is communicatively coupled to microphone 130. In one embodiment, module 110 includes power source 150 (e.g., a battery).

Another exemplary embodiment of at least a portion of the interior of module 110 is depicted in FIG. 11B. Similar to FIG. 11A, in the embodiment of FIG. 11B, the internal circuitry of module 110 includes connector 160 for communicatively (e.g., electrically) and/or physically coupling module 110 to connector 20. Also similar to FIG. 11A, in at least one embodiment, connector 160 is communicatively coupled to processing circuitry 140 (similar to earlier discussions, such processing circuitry may include sound processing circuitry). However, rather than being coupled to a microphone as in FIG. 11A, circuitry 140 is communicatively coupled to communications link 170. In the illustrated embodiment, module 110 also includes power source 150 (e.g., a battery).

Moreover, in one embodiment, at least a portion of the interior of module 110 resembles the embodiment of FIG. 11A with the addition of communications link 170 communicatively coupled to processing circuitry 140.

In various embodiments, the earpiece auditory device of the present invention overcomes the difficulties associated with prior earpiece auditory devices.

With regards to the problem of bulkiness and noticeability of earlier prior art auditory devices, as previously mentioned, when in use, preferably completely-in-canal unit 10 is positioned so deep inside the ear canal of a user as to touch the bony portion of the user's hearing canal. Accordingly, the unit is indiscernible to an observer. In addition, in one embodiment, fastener 31 and module 33 are of a particular size and shape such that, when placed behind the cartilage of the ear of a user, fastener 31 and module 33 are made invisible to an observer by the cartilage of the user's ear. Also as mentioned, in one embodiment, the dimensions of connector 20 are such that those portions of connector 20 not in the bony or outer portion of the user's ear canal or behind the user's ear when device 40 is in use are taut against the head of the user. Furthermore, in at least some of these embodiments, the dimensions of connector 20 are such that connector 20 is indiscernible to one casually viewing the user. Accordingly, in one embodiment, when device 40 is in use, its presence will be indiscernible to the casual observer. Therefore, the earlier problems of bulkiness and noticeability are reduced, if not alleviated, by the present invention.

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With respect to the occlusion dilemma discussed earlier, because, in one embodiment, completely-in-canal unit 10 is inserted so deep in the user's ear canal as to touch the bony portion, the device does not cause the patient to experience the occlusion effect. Therefore, embodiments of the present invention reduce the occlusion effect without having to resort to vents, open mold configurations, etc. (although vents, open molds, etc., may still be used for other purposes).

Similarly, with regards to the feedback problems occurring with some prior art auditory devices (e.g., conventional hearing aids), in some embodiments, the microphone(s) of device 40 (or equivalent device(s)) is mechanically isolated from the speaker(s) of device 40. Therefore, electroacoustic feedback is, at the very least, greatly reduced.

Accordingly, various embodiments of the present invention enable a user to have the benefit of a high-gain earpiece auditory device without the accompanying detriment of suffering from the occlusion effect.

In addition to the above, in some embodiments, at least portions of the earpiece auditory device are protected from one or more undesirable external elements (such as moisture, cerumen, dirt, etc.) to which certain prior art devices are susceptible.

Moreover, in one embodiment, the couplings of the earpiece auditory device do not require significant space in order to be implemented. Accordingly, significant device space and/or other limited space in around the user's ear need not be taken up by the couplings of embodiments of the present invention.

Furthermore, in one embodiment, the coupling(s) between the connector, the behind the ear component, and the completely-in-canal component is of sufficient strength that the completely-in-canal unit and behind-the-ear unit may be removed from the user's ear by pulling on the connector without any undesirable separation of the components.

Moreover, as mentioned earlier, in a preferred embodiment, one or more portions of the earpiece auditory device may be assembled with relative ease. As a result, in one embodiment, an earpiece auditory device in accordance with the present invention may be mass produced, while at the same time provide a tailored fit to one or more users.

For example, rather than waiting until a particular customer has been fitted, tested, etc., to manufacture an auditory device for that customer, the manufacturer(s) of at least one embodiment of an earpiece auditory device of the present invention may instead make available one or more mass produced components (and/or elements thereof) of an embodiment(s) of the earpiece auditory device. The user, or other individual, may then select from the above described components, elements, etc., those components, elements, etc., that provide the fit and functional capabilities desired by the user. The user, or other individual, may then assemble the device himself/herself.

To illustrate, the manufacturer(s) may make available a plurality of behind-the-ear units from which a behind-the-ear unit operable to facilitate a particular user's intended use for an earpiece auditory device may be selected. This plurality of behind-the-ear units may include units of different types, shapes, sizes (e.g., so that a user may select a behind-the-ear unit that is of a particular size so that the unit is made invisible by the user's ear when placed behind the user's ear), functional capabilities (e.g., two or more of the behind-the-ear units may have different sound processing

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circuitry), etc. However, two or more of the behind-the-ear units may be of the same type, shape, size, functional capability, etc.

The manufacturer(s) preferably may also make available a plurality of one or more elements of a completely-in-canal unit (e.g., a plurality of ear molds and/or a plurality of speakers) and/or a plurality of completely-in-canal units, from which a user, or other individual, may select at least one of the elements to be included in the completely-in-canal unit of the user's device. Similar to the earlier discussion, the plurality of one or more elements includes elements of different, types, shapes, sizes (e.g., multiple pre-made sizes of ear molds), functional capabilities (e.g., the plurality of one or more elements may include two or more speakers having different speaker performance characteristics), etc. However, similar to the above discussion, in one embodiment, two or more of the earlier mentioned plurality may be of the same type, shape, size, functional capability, etc. In one embodiment, the earlier mentioned plurality may include universal-fit tips, such as the foam tips, slips, boots, etc., described earlier, to provide a desired fit for the user. Furthermore, custom-made ear molds may be included as well.

In addition, in one embodiment, the manufacturer(s) may also make available a plurality of connectors from which a user may select a connector to couple (physically and/or communicatively) the selected behind-the-ear unit to a selected completely-in-canal component or the completely-in-canal unit that includes the one or more selected elements. In a preferred embodiment, at least one of the connectors includes at least one end operable to detachably couple (physically and/or communicatively) the connector to the selected behind-the-ear unit or completely-in-canal unit. Similar to the above discussions, the plurality of connectors may be of different types, sizes (e.g., different lengths), shapes, functional capabilities, etc. Moreover, two or more of the plurality of connectors may be of the same type, size, shape, functional capability, etc. Preferably, from the plurality of connectors, the user may select a connector of sufficient length to couple the selected behind-the-ear component, when placed behind the ear of the particular user, to the completely-in-canal unit, when placed inside the ear canal of the particular user so deep as to touch the bony portion of the user's ear canal. In another embodiment, preferably the user may select a connector of such dimensions that when in use, those portions of the connector not in the bony or outer portion of the user's ear canal or behind the user's ear are taut against the user's head.

The above, units, elements, etc., may be offered on an individual basis or in combination with other elements, sizes, shapes, etc. (e.g., one packet may contain an ear mold of a particular shape and size, while another packet may contain ear molds of various types, shapes and sizes, while yet another packet may contain a particular length of connector, and still another packet may contain a speaker and a connector already coupled together).

As discussed earlier, the user, or other individual, may then assemble the selected pieces together to form an earpiece auditory device fitting the user's ear structure, as well as the user's intended use for the device. Accordingly, a distributor, dispenser, or the user himself/herself, may make the initial assembly of the device, instead of the manufacturer. In addition, in one embodiment, the distributor, dispenser, user, etc., may tailor the device to fit the particular user's ear structure, as well as the user's intended use for the device, by determining which combination of the

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pre-made elements, sizes, shapes, etc., provides an optimal fit and operation for the particular user.

Moreover, not only is assembly made more convenient, but disassembly, re-assembly, repair, fitting, re-fitting, etc., is made convenient as well. Preferably, as a result, the device may be repaired, etc., without the need to send the device to a repair lab or return the device to the manufacturer, thereby saving the user from the earlier described hassle associated with sending the device to the manufacturer. The same holds true with refitting the device to a particular user if the initial fit was deficient in some manner. In such instances, the distributor/dispenser and/or the user may simply experiment with the various pre-made sizes until the optimal fit for the user is found.

Thus, preferably the present invention saves time and money for the user(s), the manufacturer(s), and/or the distributor(s)/dispenser(s). However, the manufacturer may still initially assemble the auditory devices and then make the other pre-made components commercially available for repair or replacement purposes.

Another notable advantage is that, in various embodiments, the earpiece auditory device discussed above may be used in a variety of applications. For example, embodiments of the earpiece auditory device may be used in a manner similar to conventional hearing aids.

In addition, embodiments of the earpiece auditory device may be used as earphones (or similar device(s)) for such electronic devices as televisions, radios, CD players, stereos, cell phones, computers (to include personal digital assistants and other processor based devices). As mentioned, in one embodiment, the earpiece auditory device may receive transmissions from and/or broadcast transmissions to a remote device(s) by wired or wireless means (e.g., radio frequency (RF) means, optical means, magnetic induction coil, etc.).

Moreover, in at least some embodiment(s), the earpiece auditory device may receive and/or broadcast data or other transmissions (be it via wired or wireless means) to a remote device (e.g., audio files, MP3 files, voice streams, video streams, Internet broadcasts, audio e-mails, etc). The device may be complaint with the various transmission formats, protocols (to include TCP/IP, Bluetooth, etc.), and interfaces necessary to receive and/or process such transmissions.

Embodiments of the earpiece auditory device of the present invention may also be used as monitors for recordings. For example, a musician, or other individual recording sounds, may hear sounds as they are being processed by studio equipment through an embodiment of the present inventions.

In addition, embodiments of the earpiece auditory device may be used as IFB devices, e.g., for newscasters, whereby audio may be provided to the newscaster.

In addition to manipulating sound in the manner described above, embodiments of the earpiece auditory device of the present invention may be used to decrease, muffle, or eliminate certain sounds. For example, as discussed earlier, in at least one embodiment the earpiece auditory device of the present invention may be used as an electronic ear plug.

FIGS. 12A–12C illustrate potentially disposable link module 1220 integral with speaker module 1212, in accordance with an alternative embodiment of the present invention. FIGS. 13A–13C illustrate universal tip module 1330 detachably interconnectable with speaker module 1212, in accordance with embodiments of the present invention. FIGS. 14A–14B illustrate the assembly of link module 1220 and universal tip module 1330 into behind-the-ear/completely-in-canal (BTE/CIC) earpiece auditory device

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embodiment 1440, including BTE processing module, for example processing module 110, in accordance with embodiments of the present invention.

Link module 1220, similar to connector 20 of FIGS. 10A-10C, at its proximal end is detachably coupled physically and communicatively to processing module 110 using, for example, previously described module fastener 100, to construct alternative BTE/CIC earpiece auditory device embodiment 1440. The physical size and shape of processing module 110 are designed to fit discreetly and comfortably behind the user's ear. In some embodiments, processing module 110 incorporates at least one user-operable switch 1450, which can control volume, change memory, and/or select the mode of operation of processing circuitry internal to processing module 110, for example t-coil, directional microphone, wireless communication, and the like. Embodiments of interior portions of processing module 110 are described above in connection with FIGS. 11A-11B.

Similar to connector 20, link module 1220 includes flexible tubular portion 1222, which physically and communicatively couples BTE processing module 110 with CIC unit 1410, functionally analogous with CIC unit 10, described above in connection with FIG. 1. Unlike connector 20, the distal end of link module 1220 is permanently attached to speaker module 1212, which at least partially encases speaker 1540 (refer to FIG. 15A). In some embodiments, one end of tubular portion 1222 is communicatively coupled to speaker 1540, e.g., by wiring connections, and then encapsulated with speaker 1540 into the shell of speaker module 1212, e.g., using a plastic injection molding operation. The tubing material of tubular portion is typically silicone, fluorocarbon (e.g., PTFE) or similar flexible plastic material, which is attached by gluing, laser welding, or other suitable technique. Preferably speaker module 1212 is formed of a hard and rigid plastic material.

In some embodiments, CIC unit 1410 includes a universal tip assembly, for example universal tip assembly 1330, incorporating conventional soft umbrella tip 1320 slipped on over the tubular neck of hollow sleeve 1310, as depicted in FIGS. 13A-13C. Sleeve 1310 is preferably made of a soft resilient urethane or silicone type polymer material. Umbrella tip 1320 is made of a polymer material softer than that of sleeve 1310, preferably a soft silicone or alternatively a polymer foam. Universal tips or ear molds, such as umbrella tip 1320, are normally available in a range of sizes which are selectable to fit any ear canal.

In one embodiment, speaker module 1212 and sleeve 1310 are configured to be releasably latched together. Speaker module 1212 and sleeve 1310 have similarly shaped cross-sections, such that speaker module 1212 is inserted into open end 1316 of sleeve 1310. Surfaces of speaker module 1212 are appropriately tapered and/or radiused, such that they deform and pry apart the walls of sleeve 1310. Rigid flange 1214 of speaker module 1212 slides over and outwardly deflects resilient strap 1314 of sleeve 1310. After flange 1214 clears strap 1314, flange 1214 engages slot 1312 of sleeve 1310, where it is latched securely into place by resilient strap 1314, which has elastically relaxed to its undeflected shape and position. CIC unit 1410 incorporating universal tip assembly 1330 and speaker module 1212 can then be inserted within any user's ear canal. To release sleeve 1310 from speaker module 1212, a user or dispenser pries strap 1314 outwardly using a suitable tool (e.g., thumbnail) until it clears flange 1214, and then withdraws speaker module 1212 from open end 1316 of sleeve 1310 (e.g., by applying moderate pulling force to tubular portion 1222 of link module 1220). Those skilled in the art will

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recognize that other releasable latching schemes can be employed, which fall within the scope and spirit of the present invention.

Advantageously, in embodiments of earpiece auditory device 1440, link module 1220 in its entirety including speaker module 1212 is dispenser replaceable by the professional without needing to be returned to the factory. Optionally, universal tip assembly 1330, which is inexpensive, can be separately dispenser or user replaceable.

FIGS. 15A-15B depict a further embodiment of CIC/BTE earpiece auditory device 1440, including link module 1520 incorporating custom ear mold 1510 fastened by a detachable locking pin. FIGS. 15C-15F illustrate details of detachable locking pin assembly embodiment 1550 used in link module embodiment 1520. Similar to link module 1220, link module 1520 includes module fastener 100, tubular portion 1522 similar to tubular portion 1222, and integrally attached speaker module 1212, which in the present embodiment is encapsulated together with hollow straight tube 1512 aligned along the axis of speaker 1540. Speaker module 1212 can be encapsulated into a variety of sizes and shapes, but for commonality of manufacturing is depicted with the same size, shape, and material as described in connection with FIGS. 12A-12C and 14A-14B.

Custom ear mold 1510 is made of a soft polymer material, for example an elastomer or silicone in the 3-40 durometer range, and is individually shaped to fit exactly within the ear canal of a particular user. In the present embodiment, custom ear mold 1510 is encapsulated around collar 1513, which contains a clearance hole dimensioned to slide over the outer diameter of hollow straight tube 1512. Preferably custom ear mold 1510 is fabricated using a form of rapid prototyping technology, for example stereolithography (SLA). With this technology, the surface of user's ear canal or an ear mold cast from the user's ear is optically scanned, and the scan data is used to control a selective polymerization or material removal process to replicate exactly the shape of the original scanned surface. In some implementations, the scan data is digitized, electronically stored indefinitely, and/or manipulated or processed as desired. In some versions a direct replica, e.g., custom ear mold 1510 is produced from the scan data. In other versions a negative shell or mold of acrylic or other suitable material is produced directly, from which custom ear mold 1510 is produced indirectly by a casting process.

To assemble CIC module 1530 of link module 1520, custom ear mold 1510 containing collar 1513, slides over hollow straight tube 1512 encapsulated into speaker module 1212, until custom ear mold 1510 seats against speaker module 1212. Hollow detachable locking pin 1514 containing flange 1515 is inserted through the open end of collar 1513 and is forced into hollow straight tube 1512. Because the outside diameter of flange 1515 is larger than the inside diameter of hollow straight tube 1512, detachable locking pin 1514 makes an interference fit with hollow straight tube 1512, thereby deforming the outer wall of hollow straight tube 1512 and locking custom ear mold 1510 onto speaker module 1212 through frictional force. CIC module 1530 containing custom ear mold 1510 can then be inserted within the user's ear canal. To disassemble CIC module 1530, detachable locking pin 1514 can be pried out of hollow straight tube 1512 using a suitable tool, for example a wedge, vise, or pliers. Detachable locking pin 1514, collar 1513, and hollow straight tube 1512 are preferably made of a resilient silicone or fluorocarbon (e.g., PTFE) type polymer material.

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Alternatively, detachable locking pin assembly 1550 can be used to secure a conventional universal soft umbrella tip, similar to umbrella tip 1320, onto speaker module 1212.

FIGS. 16A–16B depict an alternative earpiece auditory device, in accordance with embodiments of the present invention, having a custom ear mold directly encapsulated onto link module 1620. Similar to link module 1520 depicted in FIGS. 15A–15B, link module 1620 incorporates module fastener 100, tubular portion 1522, and speaker module 1212 encasing speaker 1540. Custom ear mold 1610 similar to custom ear mold 1510 is directly encapsulated around speaker module 1212. Orifice 1612 in the tip of custom ear mold 1610 provides a sound conducting passage to speaker 1540. CIC module 1630 includes custom ear mold 1610 and speaker module 1212. The materials and fabrication technology used in custom ear mold 1610 are substantially the same as those used in custom ear mold 1510.

This nondetachable version is essentially a single-piece component that includes speaker module 1212 all the way to custom ear mold 1610. Speaker 1540 is thus completely encapsulated into a custom molded component, and accordingly would be disposable, such that if speaker 1540 failed, rather than repairing that speaker, an entire exact duplicate assembly can be recreated using the electronically stored scan data file of that particular ear mold. Everything including entire link module 1620 and from there downward would be replaced.

Detachability typically occurs between module fastener 100 at the proximal end of link module 1620 and BTE processing module 110. In other words, the complete custom version auditory device appears as a two-piece unit to the user or dispenser: just the BTE processor 110 and link module 1620 including integral speaker module 1212 and custom ear mold 1610, versus the three-piece configuration of universal version 1440.

In some embodiments, the distal end of link module 1220 or 1620 could be detachable from the speaker module and ear mold. However, it may be more cost effective and efficient not to add the complexity and expense of the additional distal connector pins to couple wires that go through that link to the speaker, but simply to make link module 1220 or 1620 disposable including integral speaker module 1212 and custom ear mold 1610.

In alternative embodiments, the proximal end of link module 1220 or 1620 could be nondetachably integrated with BTE processing module 110, thereby eliminating detachable module fastener 100, such that BTE/CIC earpiece auditory device 1440 can be manufactured as a single-piece disposable unit.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the invention as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiment of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification. As one of ordinary skill in the art will readily appreciate from the disclosure of the present invention, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or alter to be developed that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized according to steps.

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What is claimed is:

1. An earpiece auditory device comprising:
  - a behind-the-ear (BTE) component, said BTE component being shaped to fit behind an ear of a user, wherein said BTE component comprises a module including processing circuitry;
  - a completely-in-canal (CIC) component, said CIC component being shaped to fit into the ear canal of the user, wherein said CIC component comprises an ear mold and a speaker, said speaker being encased in a speaker module; and
  - a connector physically and communicatively coupling said BTE component to said CIC component, said connector having a proximal end physically and communicatively coupled to said BTE component and a distal end physically and communicatively coupled to said CIC component, said connector being sufficiently rigid so as to allow said connector to be used to insert and remove said CIC component from the ear canal of the user;
- wherein said speaker module is detachably physically interconnected with said ear mold, said speaker module is interconnected with said ear mold through a hollow sleeve, and said hollow sleeve is formed of resilient material.
2. The device of claim 1 wherein said connector is detachably coupled at said proximal end with said BTE component.
3. The device of claim 1 wherein said connector is detachably coupled at said distal end with said CIC component.
4. The device of claim 1 wherein said connector is a disposable component.
5. The device of claim 1 wherein said speaker module is a disposable component.
6. The device of claim 1 wherein said speaker module is formed of a hard and rigid polymer material.
7. The device of claim 1 wherein said ear mold is stretched over a tubular neck of said hollow sleeve.
8. The device of claim 7 wherein said ear mold and said hollow sleeve constitute a disposable component.
9. The device of claim 1 wherein said hollow sleeve detachably latches to said speaker module.
10. The device of claim 9 wherein a protruding flange formed in the surface of said speaker module engages a slot defined by a resilient strap formed in said hollow sleeve.
11. The device of claim 1 wherein said ear mold is a universal fit ear mold.
12. The device of claim 11 wherein said universal fit ear mold is formed of a soft polymer material selected from the group consisting of a soft silicone polymer and a soft foam polymer.
13. The device of claim 1 wherein said ear mold is a custom fit ear mold.
14. The device of claim 13 wherein said custom fit ear mold is formed of polymer material selected from the group consisting of soft polymer materials, elastomers, and silicone in the 3–40 durometer range.
15. The device of claim 1 wherein said speaker module is interconnected detachably with said ear mold through a locking pin assembly.
16. The device of claim 15 wherein said locking pin assembly is formed of resilient polymer material selected from the group consisting of silicone polymer material and fluorocarbon polymer material.
17. The device of claim 15 wherein said locking pin assembly is disposable.
18. The device of claim 17 wherein said speaker module, said ear mold, and said locking pin assembly constitute a disposable component.

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19. The device of claim 1 wherein said speaker module is integrally encapsulated into said ear mold.

20. The device of claim 19 wherein said ear mold and said integrally encapsulated speaker module constitute a disposable component.

21. The device of claim 1 wherein said BTE component incorporates at least one user-operable switch.

22. A method for providing a plurality of earpiece auditory device components, a portion of which may be assembled to form an earpiece auditory device tailored to a user, said method comprising:

providing a selected behind-the-ear (BTE) component operable to facilitate the user's intended use for the earpiece auditory device may be selected, wherein said BTE component comprises a module including processing circuitry;

providing a selected completely-in-canal (CIC) component, said selected CIC component being shaped to fit into the ear canal of the user, wherein said selected CIC component comprises an ear mold and a speaker, said speaker being encased in a speaker module; and

providing a connector of sufficient length to physically couple said selected BTE component when said selected BTE component is placed behind the ear of the user to said selected CIC component when said CIC component is placed inside the ear canal of the user, wherein said connector of sufficient length includes a proximal end physically and communicatively operable to couple to said BTE component and a distal end physically and communicatively operable to couple to said CIC component, said connector of sufficient length being sufficiently rigid so as to allow said connector of sufficient length to be used to insert and remove said selected CIC component;

wherein said speaker module is detachably physically interconnectable with said ear mold.

23. The method of claim 22 wherein said selected connector is operable to detachably couple at said proximal end with said BTE component.

24. The method of claim 22 wherein said selected connector is operable to detachably couple at said distal end with said CIC component.

25. The method of claim 22 wherein said speaker module is formed of a hard and rigid polymer material.

26. The method of claim 22 wherein said speaker module is interconnectable with said ear mold through a hollow sleeve, and said hollow sleeve is formed of resilient polymer material selected from the group consisting of urethane polymer and silicone polymer, and said ear mold is slipped over a tubular neck via said hollow sleeve.

27. The method of claim 22 wherein said speaker module is interconnectable with said ear mold through a hollow sleeve, and said hollow sleeve is formed of resilient polymer material selected from the group consisting of urethane polymer and silicone polymer, and said hollow sleeve detachably latches to said speaker module.

28. The method of claim 27 wherein said latching comprises the steps of:

inserting said speaker module into an open end of said hollow sleeve;

engaging a flange of said speaker module into a slot defined by a resilient strap formed in said hollow sleeve; and

retaining said flange with said resilient strap.

29. The method of claim 28 wherein said detaching of said speaker module from said hollow sleeve comprises the steps of:

deflecting said resilient strap such that said flange is released from said slot; and

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when said resilient strap clears said flange, withdrawing said speaker module from said open end of said hollow sleeve.

30. The method of claim 22 wherein said ear mold is a universal fit ear mold.

31. The method of claim 30 wherein said universal fit ear mold is formed of a soft polymer material selected from the group consisting of a soft silicone polymer and a soft foam polymer.

32. The method of claim 22 wherein said ear mold is a custom fit ear mold.

33. The method of claim 32 wherein said custom fit ear mold is formed using a rapid prototyping technology.

34. The method of claim 33 wherein using said rapid prototyping technology comprises the steps of:  
scanning the surface of a user's ear canal; and  
applying the data obtained from said scanning to substantially replicate the surface contours of said user's ear canal in a solid ear mold material.

35. The method of claim 33 wherein using said rapid prototyping technology comprises the steps of:

scanning the surface of a cast impression of a user's ear canal; and

applying the data obtained from said scanning to substantially replicate the surface contours of said user's ear canal in a solid ear mold material.

36. The method of claim 33 wherein using said rapid prototyping technology comprises the step of casting said custom fit ear mold in a casting shell generated using scan data obtained from said user's ear canal.

37. The method of claim 32 wherein said custom fit ear mold is formed of polymer material selected from the group consisting of soft polymer materials, elastomers, and silicone in the 3-40 durometer range.

38. The method of claim 22 wherein said speaker module is interconnected detachably with said ear mold through a locking pin assembly.

39. The method of claim 38 wherein said locking pin assembly is formed of resilient polymer material selected from the group consisting of silicone polymer material and fluorocarbon polymer material.

40. The method of claim 38 wherein said locking pin assembly is fastened using an interference fit.

41. The method of claim 22 wherein said speaker module is integrally encapsulated into said ear mold.

42. An auditory device comprising:

a processing module comprising audio processing circuitry;

an in-the-canal (ITC) component, wherein said ITC component comprises an ear mold and a speaker, said speaker being encased in a speaker module; and

a connector physically and communicatively coupling said processing module component to said ITC component, said connector having a proximal end physically and communicatively coupled to said processing module and a distal end physically and communicatively coupled to said ITC component;

wherein said speaker is interconnected detachably with said ear mold through a locking pin assembly.

43. The device of claim 42 wherein said locking pin assembly is formed of resilient polymer material selected from the group consisting of silicone polymer material and fluorocarbon polymer material.

44. The device of claim 42 wherein said locking pin assembly is fastened using an interference fit.

45. The device of claim 42 wherein said speaker is integrally encapsulated into said ear mold.

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## **CERTIFICATE OF SERVICE**

I certify that on May 19, 2014, I served the foregoing document on all counsel of record by email via the Court's CM/ECF system.

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## **CERTIFICATE OF COMPLIANCE**

Pursuant to Federal Rule of Appellate Procedure 32(a)(7)(C), I certify that this Brief for Appellee is proportionately spaced and contains 12,911 words excluding parts of the document exempted by Rule 32(a)(7)(B)(iii).

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May 19, 2014

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